Project Manual

JOHN A. BISHOP ELEMENTARY SCHOOL OFFICE RENOVATION PROJECT

Arlington Facilities Department Project Number #23-33 25 Columbia Road, Arlington, MA 02474

May 25, 2023





AUDREY O'HAGAN ARCHITECTS, LLC

63 Pleasant St., Suite 300 Watertown, MA, 02472 (Tel) 617 497 2007 Project No. 228.00

PROJECT MANUAL

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TOWN OF ARLINGTON

INVITATION FOR BID #23-33

Sealed Bids for construction of **#23-33 John A. Bishop Elementary School Office Renovation Project,** in accordance with Contract Documents prepared by **Audrey O'Hagan Architects, LLC**, 63 Pleasant St, Suite 300, Watertown, MA, 02472, hereinafter called the Architect, will be received by the **Town of Arlington,** acting by and through its **Town Manager**, hereinafter called the "Awarding Authority" or "Owner" at:

Office of the Town Manager/Purchasing Department

Town Hall Annex, 730 Massachusetts Ave, Arlington, MA 02476

Bids must be received no later than **10:00 a.m.**, **June 15, 2023**, at which time and place they will be publicly opened and read aloud. Any bid received after the time and date specified will not be considered.

Contract Documents including Plans and Specifications will be available for download on **June 1**, **2023**, **at 11:00 a.m.** from the Town's website www.arlingtonma.gov/purchasing. Bids must be submitted on the forms provided therein and in a sealed envelope marked on the outside with the bidder's name, address, and phone number and with the words **Bid #23-33 John A. Bishop Elementary School Office Renovation Project**.

There will be an optional pre-bid conference at the site at 25 Columbia Rd, Arlington, MA 02474 on **Thursday**, **June 8**, **2023 at 10:00 a.m.** Attendees should meet outside the main entrance to the school.

Work at the site shall commence on **July 3, 2023**, and shall be substantially complete by **August 18, 2023**.

Bidding procedures and award of the Contract shall be in accordance with the provisions of Massachusetts General Laws Chapter 30, Section 39M.

Every Bid shall be accompanied by a **bid deposit** in the form of a) cash, b) a certified check on, or a treasurer's or cashier's check issued by, a responsible bank or trust company payable to Town of Arlington, or c) a bid bond in a form satisfactory to the Awarding Authority, with a surety company qualified to do business in the Commonwealth of Massachusetts and satisfactory to the Awarding Authority and conditioned upon faithful performance by the principal of the agreements contained in the Bid. The amount of the bid deposit shall be five per cent (5%) of the value of the bid. Return of bid deposits will be in accordance with Massachusetts General Laws.

The Awarding Authority will reject Bids when required to do so by Massachusetts General Laws. In addition, the Awarding Authority reserves the right to waive any informalities in, or to reject any and all Bids if it deems it to be in the public interest so to do. The Awarding Authority also reserves the right to reject any bid if it determines that such bid does not represent the bid of a person or firm competent to perform the work as specified, or if fewer than three bids are received, or if bid prices are not acceptable without further competition.

The successful Bidder shall submit to the Awarding Authority, within 10 days of notification of contract award, a **performance bond** and also a **labor and materials or payment** bond each equal to 100% of the Contract Price and of a surety company licensed by the Commonwealth of Massachusetts Division of Insurance and satisfactory to the Awarding Authority.

Minimum Wage Rates, as determined by the Director of the Department of Labor Standards of the Executive Office of Labor and Workforce Development under the provisions of Massachusetts General Laws, Chapter 149, Sections 26 and 27d, shall prevail in the execution of the work of this project. The schedule of wage rates applicable to this contract is included in the bid documents.

All employees of the successful Bidder who are assigned to the project must pass **CORI and SORI** background checks.

Massachusetts General Laws are incorporated herein by reference. Any inconsistency between the Invitation to Bid, Instructions to Bidders, Bid Forms, Conditions of the Contract, and any other Contract Documents and these statutes, or any other applicable statutes, bylaws, or regulations existing on the date on which the bids are to be received, shall not be grounds for invalidating the bidding procedures, but, where required by law, such statute, bylaw, or regulation shall be deemed to govern.

Questions regarding this Invitation to Bid should be directed to the Town's Purchasing Department at mdenatale@town.arlington.ma.us.

Sanford Pooler Town Manager

June 1, 2023

TOWN OF ARLINGTON

INSTRUCTIONS TO BIDDERS

A. PROPOSAL REQUIREMENTS

- Sealed proposals for #23-33 John A. Bishop Elementary School Office Renovation
 Project, will be received at the time and place as stated in the "Invitation to Bid" and in accordance with bid documents prepared by Audrey O'Hagan Architects, LLC.
- 2. Bids must be submitted on the forms included in the bid documents of the Project Manual and signed by the bidder. All blank spaces provided on the bid forms shall be filled in with ink or typewritten. Where space is provided, sums shall be expressed in both words and numerals. In case of discrepancy between the two, the written words shall govern.
- 3. Each Bidder shall acknowledge any and all required alternates in **Part C** on the Form for General Bid by entering the dollar amount of addition or subtraction necessitated by each alternate.
- 4. The Awarding Authority is exempt from sales and federal excise tax to the extent permitted under law; Bidders should not include such taxes in figuring their Bid.
- 5. No interlineations, additions, alterations, or erasures shall be made on the forms.
- 6. Every Bid shall be accompanied by a bid deposit in the form of a) cash, b) a certified check on, or a treasurer's or cashier's check issued by, a responsible bank or trust company payable to Town of Arlington, or c) a bid bond in a form satisfactory to the Awarding Authority, with a surety company qualified to do business in the Commonwealth of Massachusetts and satisfactory to the Awarding Authority and conditioned upon faithful performance by the principal of the agreements contained in the Bid. The amount of the bid deposit shall be five per cent (5%) of the value of the bid.
- 7. The Bid Form shall be properly executed and enclosed with the Bid Deposit in an envelope, sealed and plainly marked with the Bidder's name, address, and phone number and the words "John A. Bishop Elementary School Office Renovation Project" and delivered to the Office of the Town Manager/Purchasing Department located at the Robbins Memorial Town Hall Annex, Second Floor, 730 Massachusetts Avenue, Arlington, Massachusetts, 02476.
- 8. If the Bid is mailed, the aforementioned sealed envelope shall be enclosed in a second envelope identified with the above markings and mailed to the place of bid.

- 9. All bid deposits of Bidders, except those of the three lowest responsible and eligible Bidders, shall be returned within five (5) days, Saturdays, Sundays, and legal holidays excluded, after the opening of the general bids. The bid deposits of the three lowest responsible and eligible bidders shall be returned upon the execution and delivery of the Contract, or if no award is made, upon the expiration of the time prescribed by Massachusetts General Law. If any general bidder fails to perform his agreement to execute a Contract and furnish a performance bond and also a labor and materials or payment bond as stated in his general bid, his bid deposit shall become and be the property of the Town of Arlington. In case of death, disability, bona fide clerical or mechanical error of a substantial nature, or other unforeseen circumstances affecting the general bidder, his bid deposit shall be returned to him.
- 10. No claims for immunity or exceptions predicated upon misunderstanding or failure to correctly interpret the above paragraph will be allowed.
- 11. The Drawings, Specifications and Contract Documents will be available as stated in the "Invitation to Bid".

B. BIDDER'S REPRESENTATION

- 1. Each General Bidder (hereinafter called "Bidder") by making a bid (hereinafter called "Bid") represents that:
 - a. The Bidder has carefully examined and understands the Contract Documents and the Bid is made in accordance therewith.
 - b. The Bidder has visited the site and locality where the work is to be performed and has made such independent investigations as the Bidder deems necessary to identify the federal, state, and local laws, ordinances, rules, and regulations, and the conditions affecting cost, progress, or performance of the work.
 - c. The Bidder will assign to this project a full-time project superintendent whose qualifications are acceptable to both Owner and Architect.
 - d. The Bid includes all of the work delineated in the Bid Set Drawings and Specifications dated **May 25, 2023**.
- 2. Failure of any Bidder to thoroughly examine the Contract Documents, or to visit and examine the site shall in no way relieve the bidder of any obligation with respect to his/her bid or of any responsibility assigned the bidder under the Contract. No claim for additional compensation or extension of time will be allowed by the Owner because of lack of Contractor's full knowledge of existing conditions or difficulties attending the execution of this Contract.

C. BIDDER'S QUALIFICATIONS

1. No individual or firm may submit a Bid unless it includes, in the Bid Form, a list of at least **three** (3) references for similar projects completed in the last **five** (5) years.

2. All employees on the project must pass **CORI** and **SORI** background checks.

D. PRE-BID CONFERENCE

1. An optional pre-bid conference will be held on **Thursday**, **June 8**, **2023**, **at 10:00 a.m.**, **at Bishop Elementary School**, 25 Columbia Road, Arlington, Massachusetts. Attendees shall meet outside the main entrance to the school.

E. REQUESTS FOR INTERPRETATION

- Bidders are urged to communicate to the Architect in writing, at clara@ohaganarchitects.com, any ambiguity, inconsistency, or error which they may discover upon examination of the Contract Documents, the site, and local conditions.
- Interpretation of the provisions of the Contract Documents will be made by the Architect upon written request of any bidder, provided that such request is received by the Architect at clara@ohaganarchitects.com by 5:00 p.m. on June 8, 2023, the scheduled bid opening, and that the Architect considers such interpretation to be of sufficient importance.
- 3. Telephone calls pointing out any such errors or discrepancies will be taken by the Architect, but only for the purpose of receiving the information in order that it may be properly processed, and not for interpretation or clarification. Oral or telephone interpretations will not generally be made, and if made, shall be strictly informal and not legally valid or binding.
- 4. Interpretation, clarification, or change in the Contract Documents shall be in the form of an Addendum which will become part of the Contract Documents. Addenda will be posted electronically to the Town's website at www.arlingtonma.gov/purchasing. Failure to receive such Addenda shall in no way relieve any bidder from the execution of its provisions. All bidders are cautioned to verify the number of Addenda that have been issued and to secure any needed copies before submitting a Bid.
- 5. Bidders shall acknowledge each and every Addendum in the spaces provided on the Bid Form. Failure of a Bidder to do so may result in rejection of that Bidder's Bid.

F. MODIFICATION OR WITHDRAWAL OF BIDS

- Bidders may correct, modify, or withdraw a bid by written notice received by the Town prior to the time and date established for the bid opening. Bid modifications must be clearly written and easily understandable and submitted in a sealed envelope plainly labeled "Modification No.__." Each modification must be numbered in sequence and must reference the original Invitation for Bid.
- 2. No Bidder shall withdraw his Bid for a period of **sixty (60)** days, Saturdays, Sundays and legal holidays excluded, after the opening of Bids.

G. SUB-CONTRACTS

1. Work shall be performed by the General Contractor without recourse to Sub-contracts whenever possible.

H. PERFORMANCE AND PAYMENT BONDS

The successful Bidder shall submit to the Awarding Authority, within 10 days of notification of contract award, a performance bond and also a labor and materials or payment bond each equal to 100% of the Contract Price and of a surety company licensed by the Commonwealth of Massachusetts Division of Insurance and satisfactory to the Awarding Authority, provided further, that if there is more than one surety company, the surety companies shall be jointly and severally liable. The premium on the bonds shall be included in the Base Bid.

I. TIME FOR CONSTRUCTION / PROJECT SCHEDULE:

- 1. The Contractor shall commence the preparatory work under this Contract upon written Notice to Proceed from, and on the date set by, the Architect. It is anticipated that the Notice to Proceed will be issued within fourteen (14) days of the receipt of general bids.
- 2. Time is of the essence. Work at the site shall commence on **July 3, 2023**, and shall continue, without interruption and with all practical dispatch and regularity, so as to reach substantial completion by **August 18, 2023**.
- 3. If the Contractor shall fail to achieve the substantial completion date, the Contractor shall be required to pay the Awarding Authority, not as penalty but as liquidated damages, the sum of \$500 per calendar day for each day extending beyond the date of substantial completion.

J. BUILDING PERMITS

- 1. All General Bidders are advised that building permits will be required and that the <u>cost of same will be waived by the Town's Inspectional Services Department.</u> The General Contractor shall receive the building permits prior to performing any work on the project.
- 2. The General Bidder is responsible for any other permits, fees, inspections, etc., as may be required by State and local authorities.

K. GENERAL BID LAWS

 Commonwealth of Massachusetts General Bid Laws Section 149, Sections 44A through 44J inclusive, and Chapter 30, Section 39M, are incorporated herein by reference. Any inconsistency between the Invitation to Bid, Instruction to Bidders, Bid Forms, Conditions of the Contract, and any other Contract Documents and these statues, or any other applicable statues, by-laws, or regulations existing of the date on which the bids are received, shall not be grounds for invalidating the bidding procedures, but where required by law, such statute, by-law, or regulation shall be deemed to govern.

L. PREVAILING WAGES

 Minimum Wage Rates, as determined by the Director of the Department of Labor Standards of the Executive Office of Labor and Workforce Development under the provisions of Massachusetts General Laws, Chapter 149, Sections 26 and 27d, shall prevail in the execution of the work of this project. The schedule of wage rates applicable to this contract is included in the bid documents.

M. AWARD OF CONTRACT

- 1. The Contract will be awarded to the lowest responsible and eligible bidder in accordance with Chapter 149, Sections 44A through 44J of the Massachusetts General Laws.
- 2. The Awarding Authority reserves the right to accept or reject any and all bids, wholly or in part, or to waive minor informalities in any or all bids, if it be in the public interest so to do.
- 3. The Awarding Authority reserves the right to reject any bid if it determines that such bid does not represent the bid of a person or firm competent to perform the work as specified, or if less than three bids are received, or if bid prices are not acceptable without further competition.
- 4. The Awarding Authority may consider informal and may reject any bid which is not prepared and submitted in accordance with all requirements of the bid documents, or which contains erasures, alterations, additions, errors or irregularities of any kind, or which contains proposed prices for any class or item of work which are, in the judgment of the Awarding Authority, substantially less or more than the actual cost to complete the work; provided, however, that the Awarding Authority reserves the right to waive any and all informalities as to form. Matters as to substance shall not be waived.
- Subject to the provisions of applicable laws, if the bid forms, specifications, or any other bid documents require submission of special information or data to accompany bids for any trade, if applicable, and any bidder neglects to furnish such information or data with its bid, the Awarding Authority may reject the bid of such bidder as incomplete; provided, however, that the Awarding Authority reserves the right to deem any such omission as an informality for which such bid will not be rejected, and to subsequently receive such information or data prior to award of the contract.

N. COMPLEMENTARY DOCUMENT

1. INVITATION FOR BID, included herewith, is complementary to this document and shall be carefully reviewed by bidders for specific instructions which are not repeated herein.

O. FOREIGN CORPORATIONS

1. The attention of bidders is called to the General Laws, Chapter 30, Section 39L, as amended by The Acts of 1967, Chapter 3, under which the Awarding Authority may not enter into a contract with a foreign corporation (a corporation not organized under the Laws of Massachusetts), nor approve a foreign corporation as a contractor, unless the foreign corporation has filed with the Awarding Authority a certificate by the State Secretary stating that the foreign corporation has complied with General Laws, Chapter 181, Sections 3 and 5, and stating the date of such compliance.

TOWN OF ARLINGTON

FORM FOR GENERAL BID

TO THE AWARDING AUTHORITY:

A. The undersigned proposes to furnish all labor and materials required for the construction of **#23-33 John A. Bishop Elementary School Office Renovation**, in Arlington, Massachusetts, in accordance with the accompanying plans and specifications prepared by **Audrey O'Hagan Architects**, **LLC**, and dated **May 25**, **2023**, for the contract price specified below, subject to additions and deductions according to the terms of the specifications.

B. This Bid includes Addenda nu	nbered	
C. The proposed contract price is	:	dollars
(\$)	
For Alternate No. 1 Add	\$	
For Alternate No. 2 Add	\$	
include all costs to provide, procuto labor, materials, equipment, su of the information/requirements thand Specifications.	re, fabricate, install, and/or respectively.	esed bid is as follows. Each price shall epair the work item, including but not limited fits. Items provided below do not include all e bid. The Bidder must refer to the Drawings
BASE BID BREAKDOWN		
A. General Conditions:		
Project Mobilization:	;	\$
2. Project General Requirement	nts:	\$
3. Debris Removal:	,	\$
4. Temporary Protection:	,	\$
B. General Scope of Work Items:		
1. Demolition/Coring:	,	\$
Company Name of Bidder:		

2.	Carpentry:	\$
3.	Millwork:	\$
4.	Cabinets/Counters:	\$
5.	Doors/Frames/Hardware:	\$
6.	Glass & Glazing:	\$
7.	Drywall Work:	\$
8.	Acoustic Ceilings:	\$
9.	Painting:	\$
10.	Carpet Tiles	\$
11.	Rubber Base	\$
12.	Window Shades	\$
13.	Counter Tops	\$
14.	Fire Protection	\$
15.	Plumbing	\$
16.	HVAC	\$
17.	Electrical	\$
18.	Insurances	\$
19.	Other Work: Any other work noted in the Drawings and Specifications not covered by the categories above.	\$
Contra	ctor shall provide minimum warranty on labor as desc	ribed in these Contract Documents.

Company Name of Bidder:

Bishop Elementary School Office Renovation #23-33 E. The undersigned hereby certifies, under the pains and penalties of perjury, that he has carefully examined the Contract Documents, examined the site and locality where the work is to be performed, established a thorough understanding of the existing conditions, made such independent investigations as the Bidder deems necessary to identify the federal, state, and local laws, ordinances, rules, and regulations, and the conditions affecting cost, progress, or performance of the work, and has obtained sufficient information for executing the work of his bid and the work of all related trades.

The undersigned agrees that, if selected as Contractor, he will within five (5) days, Saturdays, Sundays, and legal holidays excluded, after presentation thereof by the Awarding Authority, execute the Contract in accordance with the terms of this bid and furnish a performance bond and also a labor and materials or payment bond each of a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the Awarding Authority and each in the sum of the contract price, the premiums for which are to be paid by the Contractor and are included in the Contract Price; provided, however, that if there is more than one surety company, the surety companies shall be jointly and severally liable.

The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards made subject to section 44A of chapter 149.

The undersigned further certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the commonwealth under the provisions of section 29F of chapter 29, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

The undersigned bidder hereby certifies, under the pains and penalties of perjury, the foregoing bid is based upon the payment to laborers to be employed on the project of wages in an amount no less than the applicable prevailing wage rates established for the project by the Massachusetts Department of Labor Standards. The undersigned bidder agrees to indemnify the awarding authority for, from and against any loss, expense, damages, actions or claims, including any expense incurred in connection with any delay or stoppage of the project work, arising out of or as a result if (1) the failure of the said bid to be based upon the payment of the said applicable prevailing wages rates or (2) the failure of the bidder, if selected as the contractor, to pay laborers employed on the project the said applicable prevailing wage rates.

Company Name of Bidder:		

Date:	
	Bidder's Company/Firm Name
	Authorized Signature
Affix Corporate Seal Here (if applicable)	Printed Name & Title
	Fillited Name & Title
	Business Address
	City, State, Zip
	Business Phone/Fax
	Business Email
BIDDER MUST ATTACH THE	FOLLOWING TO THIS BID FORM:
I. Bidder's proposed schedule with each major tas	k broken out and including start and finish dates.
2. Statement of Bidder's Qualifications on form pro	vided herein.
2. Certificate of Non-Collusion and Certificate of St	ate Tax Compliance.
Company Name of Bidder:	

TOWN OF ARLINGTON STATEMENT OF BIDDER'S QUALIFICATIONS

Please type or print legibly. If necessary, add additional sheets for starred items. This information will be utilized by the Town of Arlington for purposes of determining bidder responsiveness and responsibility with regard to the requirements and specifications of this contract.

This form must be attached by the bidder to the completed bid form.

1. Firm name		
2. Number of years bidder has done	business under its present name	
*3. Has the bidder ever failed to comp YESNO	lete a contract awarded to her/him?	
If yes, where and why		
complexity and value to that of the wo such projects. Use additional sheets if forms include all of the information rec		ree
Project Name/Location		
Owner Name/Address		
Contract Value	Date Completed	
Type of Work		
	Telephone No	
Project Name/Location		
Owner Name/Address		
Contract Value	Date Completed	
Type of Work		
	Telephone No	
Company Name of Bidder:		

Project Name/Location		
Owner Name/Address		
Contract Value	Date Completed	
Type of Work		
	Telephone No	
Project Name/Location		
Owner Name/Address		
Contract Value	Date Completed	
Type of Work		
	Telephone No	
Project Name/Location		
Owner Name/Address		
Contract Value	Date Completed	
Type of Work		
	Telephone No	
Project Name/Location		
Owner Name/Address		
Contract Value	Date Completed	
Type of Work		
Contact Person	Telephone No	
Company Name of Bidder:		

CERTIFICATE OF NON-COLLUSION

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in the certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals.	nis
Signature of individual submitting bid or proposal	
Name of business	
THIS NON-COLLUSION FORM MUST BE SIGNED AND SUBMITTED WITH THE BID OR PROPOSAL	
TAX COMPLIANCE CERTIFICATION	
Pursuant to M.G.L. c. 62C, §49A, the undersigned, acting on behalf of the Contractor, certifies under the penalties of perjury that the Contractor is in compliance with all laws of the Commonwealth of Massachusetts relating to taxes, reporting of employees and contractors, a withholding and remitting child support.	
Signature of Individual submitting bid or proposal	
Name of business	

TOWN OF ARLINGTON

GENERAL CONTRACT

THE TOWN OF ARLINGTON, a municipal corporation of the Commonwealth of Massachusetts, acting through its Town Manager, and

(The Contractor) hereby mutually agree as follows:

<u>ARTICLE I – THE CONTRACT DOCUMENTS</u>

The Contract Documents, as defined in the CONSOLIDATED GENERAL CONDITIONS and SUPPLEMENTAL STATUTORY CONDITIONS, including said CONSOLIDATED GENERAL CONDITIONS and SUPPLEMENTAL STATUTORY CONDITIONS, are hereby incorporated by reference and made a part hereof, and shall include Addenda and Alternates, if any.

ARTICLE II – GENERAL DESCRIPTION OF THE WORK

The Contractor shall furnish all of the materials and perform all of the Work required by the Contract Documents entitled <u>Bid #23-33 Bishop Elementary School Office Renovation</u>, <u>Arlington</u>, <u>MA</u>, prepared by <u>Audrey O'Hagan Architects</u>, <u>LLC</u>, acting as, and in these Contract Documents entitled, the Architect.

ARTICLE III – COMMENCEMENT AND COMPLETION OF WORK AND LIQUIDATED DAMAGES

It is agreed that time is of the essence of this Contract.

The Contractor shall commence work only upon the execution of this Contract by the Town of Arlington by its Town Manager, the certification of the availability of the appropriation by the Town Comptroller, approval as to form by the Town Counsel, and upon issuance of a Notice to Proceed, and shall bring the Work to Substantial Completion by August 18, 2023, and to Final Completion within 15 calendar days thereafter. Liquidated damages in the amount of \$500.00 per calendar day will be applicable after the date of Substantial Completion for which the project is not substantially complete, and for each day after the date of Final Completion for which the project is not finally complete, and otherwise in accordance with the provisions of the CONSOLIDATED GENERAL CONDITIONS and SUPPLEMENTAL STATUTORY CONDITIONS. The liquidated damages amount per calendar day is a minimum damage figure to compensate the Owner for administrative costs and loss or delay of its use of the building and site, and does not limit in any way the liability of the Contractor for damages in excess of the specified liquidated damages amount for other damages, for example, damages for breach of Contract, and added architect and consultant fees. It is expressly understood that such

liquidated damages do not constitute a penalty. All work shall be phased (if applicable) in accordance with the Contract Documents.

NOTE: NOTWITHSTANDING ANYTHING TO THE CONTRARY, THE TIME OF COMMENCEMENT SHALL ONLY BE BY WRITTEN NOTICE TO PROCEED WITH THE WORK AS DATED AND ISSUED TO THE CONTRACTOR BY THE TOWN OF ARLINGTON. NOTICE TO PROCEED MAY BE GIVEN ANYTIME AFTER THE AWARD OF THE CONTRACT, BUT NOT LATER THAN 14 DAYS AFTER THE EXECUTION OF THE CONTRACT.

<u>ARTICLE IV – COMPENSATION TO BE PAID BY TOWN</u>

The Town shall pay and the Contractor shall a furnished, done by or resulting to the Contract additions and deductions in the Contract Docu	tor in carrying out this Contract, subject to	
	<u> </u>	
ARTICLE V – AVAILABILITY OF APPRO	PRIATION	
This Contract is subject to an appropriation be	eing available therefor.	
This Contract is executed by the Town of Arlin, 2023 .	ngton and by the Contractor as of this	_day o
CONTRACTOR	FOR THE TOWN OF ARLINGTON	
Signature of Authorized Individual	Sanford Pooler, Town Manager	
	Approved as to Form	
Name		
	Douglas Heim, Town Counsel	
Title	Certification of Funds	
Firm/Company Name		
(Affix Corporate Seal Here, if applicable)	lda Cody, Comptroller #	

PERFORMANCE BOND

Bond No	
	NT, that we with a place of
business at	as principal (the "Principal"), and
, a corporatio	n qualified to do business in the Commonwealth of
Massachusetts, with a place of business at	as Surety (the "Surety"), are held and
firmly bound unto the Town of Arlington as C	Obligee (the "Obligee"), in the sum of
A : 4 1 :14 4 OH: 6 1:1	lawful money of the United States of
	payment, well and truly to be made, we bind ourselves, our ccessors and assigns, jointly and severally, firmly by these
WHEREAS, the Principal has assumed and m	ade a contract with the Obligee, bearing the date of
contract shall well and truly keep and perform conditions of said contract on its part to be ke any extensions thereof that may be granted by the life of any guarantee required under the co- undertakings, covenants, agreements, terms an	are such that if the Principal and all Subcontractors under said all the undertakings, covenants, agreement, terms, and pt and performed during the original term of said contract and the Obligee, with or without notice to the Surety, and during ontract, and shall also well and truly keep and perform all the and conditions of any and all duly authorized modifications, waived, then this obligation shall become null and void; the
the applicable provisions of the Contract, the writing by the Town of Arlington promptly ta accordance with its terms and conditions.	y the Principal, or is terminated by the Town of Arlington under Surety hereby further agrees that the Surety shall, if requested in ke such action as is necessary to complete said Contract in Surety have hereto set their hands and seals this day of
	curety have hereto set their hands and seals this ady or
PRINCIPAL	SURETY
[Name and Seal]	[Attorney-In-Fact]
[Title]	[Address]
	[Phone]
Attest:	Attest:
The rate of the Bond is% of the first \$	and% for the next \$
The total premium	for this Rond is \$

PAYMENT BOND

Bond No			
place of business atandCommonwealth of Massachusetts,	, a corporati	hat we as principal (the "Principal (the "Principal (the "Principal (the "Principal (the "Principal") as principal (t	cipal"), as
•	elves, our respec	be paid to the Obligee, for which paynetive heirs, executors, administrators, present.	
WHEREAS, the Principal has assu- , for the		contract with the Obligee, bearing th	e date of
under said contract shall pay for all employed in said contract and in an extensions of time, changes or addi Surety of such modifications, altera waived, the foregoing to include an provisions of Massachusetts Generally, as amended then this obligation force and virtue.	I labor performed by and all duly a ditions to said cor- lations, extension by other purpose al Laws, Chapte of shall become n	uch that if the Principal and all subcodor furnished and for all materials us uthorized modifications, alterations, natract that may hereafter be made, not as of time, changes or additions being sor items set out in, and to be subject at 30, Section 39A, and Chapter 149, Sull and void; otherwise, it shall remain	ice to the hereby to, the Section n in full
IN WITNESS WHEREFORE, the day of		arety have hereto set their hands and s	eals this
PRINCIPAL		SURETY	_
[Name and Seal]		[Attorney-In-Fact][Seal]	_
[Title]		[Address]	_
		[Phone]	_
Attest:	_	Attest:	_
\$		and% for the	next
The total premi	ium for this Bon	nd is \$	

END OF PAYMENT BOND

CONSOLIDATED GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

ARTICLE 1

GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents consist of the Agreement between Owner and Contractor (hereinafter the Agreement), the Consolidated General Conditions of the Contract for Construction, the Supplemental Statutory Conditions, Drawings, Specifications, including all numbered sections, Addenda issued prior to execution of the Contract, Instructions to Bidders and Proposal, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include other documents such as bidding requirements (advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or portions of addenda relating to bidding requirements).

In the event of any conflict among the Contract Documents, the Documents shall be construed according to the following priorities:

Highest Priority: Modifications Second Priority: Agreement

Third Priority: Addenda--later date to take precedence
Fourth Priority: Supplemental Statutory Conditions
Fifth Priority: Consolidated General Conditions
Sixth Priority: Specifications and Drawings

Seventh Priority: Instructions to Bidders and Proposal

Any references throughout the contract documents (or any other project documents) to "General Conditions" or "Supplementary General Conditions" are deleted and "Consolidated General Conditions and Supplemental Statutory Conditions" is substituted therefor. All bidders and subbidders take note that the Town has consolidated and modified former versions of the standard form AIA Document A210 General Conditions of the Contract for Construction with the Town's desired Supplementary General Conditions into one document. The Supplemental Statutory Conditions remain intact and separate, and form a part of the Contract Documents.

1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. Except as provided in Paragraph 3.18, nothing contained in the Contract Documents shall be construed to create any contractual relationship (1) between the Architect and the Contractor, (2) between the Owner or the Architect and a Subcontractor or Subsubcontractor, (3) between the Owner and the Architect, or (4) between any persons or entities other than the Owner and the Contractor. The Contract Documents shall comply with the requirements of Mass. Gen. Laws Chapter 44, Section 31C.

1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner or by separate contractors.

1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards and workmanship for the Work, and performance of related services.

1.1.7 THE PROJECT MANUAL

The Project Manual is the volume usually assembled for the work which may include the bidding requirements, sample forms, Consolidated General Conditions of the Contract and Specifications.

1.2 EXECUTION, CORRELATION AND INTENT

- 1.2.1 The Contract Documents shall be signed by the Owner and Contractor as provided in the Agreement. A copy of the signed set shall be deposited with the Architect. If either the Owner or Contractor or both do not sign all the Contract Documents, the Architect shall identify such unsigned Documents upon request.
- 1.2.2 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents. By executing the Contract, the Contractor also certifies, under penalties of perjury, that to the best of his information, knowledge and belief he has complied with all laws of the Commonwealth of Massachusetts relating to taxes.
- 1.2.3 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results. All Work mentioned or indicated in the Contract Documents shall be performed by the Contractor as part of this Contract unless it is specifically indicated in the Contract Documents that such Work is to be done by others.
- 1.2.4 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.
- 1.2.5 Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.
- 1.2.6 Where codes, standards, requirements and publications of public and private bodies are referred to in the Specifications, references shall be understood to be to the latest revisions prior to the date of receiving bids, except where otherwise indicated.
- 1.2.7 Where no explicit quality or standards for materials or workmanship are established for Work, such Work or materials is to be of good, workmanlike quality for the intended use and consistent with the quality of the surrounding Work and of the construction of the Project generally.
- 1.2.8 All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the manufacturer's written or printed directions and instructions unless otherwise indicated in the Contract Documents.
- 1.2.9 The Mechanical, Electrical and Fire Protection Drawings are diagrammatic only, and are not intended to show the alignment, physical locations or configurations of such Work.

Such Work shall be installed without additional cost to the Owner to clear all obstructions, permit proper clearances for the Work of other trades, and present an orderly appearance where exposed. Prior to beginning such Work, the Contractor shall prepare coordination drawings showing the exact alignment, physical location and configuration of the Mechanical, Electrical and Fire Protection installations and demonstrating to the Contractor's satisfaction that the installations will comply with the preceding sentence.

- 1.2.10 Exact locations of fixtures and outlets shall be obtained from the Architect as provided in Subparagraph 3.2.5 before the Work is roughed in; Work installed without such information from the Architect shall be relocated at the Contractor's expense.
- 1.2.11 Test boring or soil test information included with the Contract Documents or otherwise made available to the Contractor was obtained by the Owner for use by the Architect in the design of the Project or Work. The Owner does not hold out such information to the Contractor as an accurate or approximate indication of subsurface conditions, and no claim for extra cost or extension of time resulting from a reliance by the Contractor on such information shall be allowed except as provided in Subparagraph 4.3.6.

1.3 OWNERSHIP AND USE OF ARCHITECT'S DRAWINGS, SPECIFICATIONS AND OTHER DOCUMENTS

1.3.1 The Drawings, Specifications and other documents prepared by the Architect are instruments of the Architect's service through which the Work to be executed by the Contractor is described. The Contractor may retain one contract record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect, and unless otherwise indicated, and except as provided in the Owner/Architect Agreement for the Project, the Architect shall be deemed the author of them and will retain all common law, statutory and other reserved rights, in addition to the copyright. All copies of them, except the Contractor's record set, shall be returned or suitably accounted for to the Architect, on request, upon completion of the Work. The Drawings, Specifications and other documents prepared by the Architect, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner and Architect. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect appropriate to and for use in the execution of their Work under the Contract Documents. All copies made under this license shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's copyright or other reserved rights.

Notwithstanding anything herein to the contrary, as between the Owner and Architect, their rights and obligations with respect to the Architect's instruments of service are governed by the provisions of the Owner/Architect Agreement for the Project.

1.4 CAPITALIZATION

1.4.1 Terms capitalized in these General Conditions include those which are (1) specifically defined, (2) the titles of numbered articles and identified references to Paragraphs, Subparagraphs and Clauses in a document or (3) the titles of documents published by the American Institute of Architects.

1.5 INTERPRETATION

1.5.1 In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

ARTICLE 2

OWNER

2.1 DEFINITIONS

- 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. From time to time herein the Owner is referred to as the Town.
- 2.1.2 The Project Manager is the person or entity identified as such in writing by the Owner, at the Owner's option. The Project Manager shall act as the Owner's representative with respect to all matters pertaining to the Project. The duties, responsibilities, and obligations of the Project Manager under this Contract may be modified from time to time by the Town, so long as such modifications do not interfere materially with the Contractor's performance of the Work hereunder, and so long as the Contractor is given notice of any such modifications that affect the Contractor's performance of the Work.

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

- 2.2.1 The Owner upon reasonable written request shall furnish to the Contractor in writing information which is necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein at the time of execution of the Agreement.
- 2.2.2 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site.

- 2.2.3 Except for permits and fees which are the responsibility of the Contractor under the Contract Documents, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures, or for permanent changes in existing facilities.
- 2.2.4 Information or services required of the Owner hereunder shall be furnished by the Owner with reasonable promptness after receipt from the Contractor of a written request for such information or services.
- 2.2.5 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, such copies of Drawings and Project Manuals as are reasonably necessary for execution of the Work.
- 2.2.6 The foregoing are in addition to other duties and responsibilities of the Owner enumerated herein and especially those in respect to Article 6 (Construction by Owner or by Separate Contractors), Article 9 (Payments and Completion) and Article 11 (Insurance and Bonds).

2.3 OWNER'S RIGHT TO STOP THE WORK

- 2.3.1 If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Paragraph 12.2 or persistently fails to carry out Work in accordance with the Contract Documents, the Owner, by written order signed by the Project Manager, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.
- 2.3.2 The Owner may order the Contractor in writing to suspend, delay, or interrupt all or any part of the Work for such period of time as it may determine to be appropriate for the convenience of the Owner; provided however, that if there is a suspension, delay or interruption ordered by the Owner for fifteen days or more or due to a failure of the Owner to act within the time specified in this Contract, the Owner shall make an adjustment in the Contract Sum for any increase in the cost of performance of this Contract, but shall not include any profit to the Contractor on such increase; and provided further, that the Owner shall not make any adjustment in the Contract Sum under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this Contract provides for an equitable adjustment of the Contract Sum under any other contract provisions.
- 2.3.3 The Contractor must submit the amount of a claim under Subparagraph 2.3.2 to the Owner in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than 21 days after the end thereof. Except for costs due to a suspension order, the Owner shall not approve any costs in the claim incurred more than twenty days before the Contractor notified the Owner in writing of the act or failure to act involved in the claim.

2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

2.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-day period after receipt of written notice from the Owner to begin and prosecute correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Construction Change Directive shall be issued deducting from payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Architect's additional services and expenses made necessary by such default, neglect or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3

CONTRACTOR

3.1 DEFINITION

3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative.

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

- 3.2.1 Before starting the Work, and at frequent intervals during the progress thereof, the Contractor shall carefully study and compare the Contract Documents with each other and with any information furnished by the Owner pursuant to Subparagraph 2.2.2 and shall at once report to the Architect any error, inconsistency or omission the Contractor may discover. Any necessary change shall be ordered as provided in Article 7, subject to the requirements of Paragraph 1.2 and other provisions of the Contract Documents. If the Contractor proceeds with the Work without such notice to the Architect, having discovered such errors, inconsistencies or omissions, or if by reasonable study of the Contract Documents the Contractor could have discovered such, the Contractor shall bear all costs arising therefrom.
- 3.2.2 The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the Architect at once. Any necessary change shall be ordered as provided in Article 7, subject to the requirements of Paragraph 1.2 and other provisions of the Contract Documents. If the Contractor proceeds with the Work without such notice to the Architect, having discovered such errors, inconsistencies or omissions, the Contractor shall bear all costs arising therefrom.

- 3.2.3 The Contractor shall perform the Work in accordance with the Contract Documents and any submittals made in accordance with Paragraph 3.12.
- 3.2.4 The Contractor shall give the Architect timely notice of any additional Drawings, Specifications, or instructions required to define the Work in greater detail, or to permit the proper progress of the Work.
- 3.2.5 The Contractor shall not proceed with any Work not clearly and consistently defined in detail in the Contract Documents, but shall request additional drawings or instructions from the Architect as provided in Subparagraph 3.2.4. If the Contractor proceeds with such Work without obtaining further Drawings, Specifications or instructions, the Contractor shall correct Work incorrectly done at the Contractor's own expense.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

- 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract. Where the Contract Documents refer to particular construction means, methods, techniques, sequences or procedures or indicate or imply that such are to be used in the Work, such mention is intended only to indicate that the operations of the Contractor shall be such as to produce at least the quality of work implied by the operations described, but the actual determination of whether or not the described operations may be safely and suitably employed on the Work shall be the responsibility of the Contractor, who shall notify the Architect in writing of the actual means, methods, techniques, sequences or procedures which will be employed on the Work, if these differ from those mentioned in the Contract Documents. All loss, damage, liability, or cost of correcting defective work arising from the employment of any construction means, methods, techniques, sequences or procedures shall be borne by the Contractor, notwithstanding that such construction means, methods, techniques, sequences or procedures are referred to, indicated or implied by the Contract Documents, unless the Contractor has given timely notice to the Owner and Architect in writing that such means, methods, techniques, sequences or procedures are not safe or suitable, and the Owner has then instructed the Contractor in writing to proceed at the Owner's risk.
- 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons performing portions of the Work under a contract with the Contractor.
- 3.3.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.
- 3.3.4 The Contractor shall be responsible for inspection of portions of Work already performed under this Contract to determine that such portions are in proper condition to receive subsequent Work.

3.4 LABOR AND MATERIALS

- 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. The word "provide" shall mean furnish and install completely, including connections, unless otherwise specified.
- 3.4.2 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

3.5 WARRANTY

- 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect occurring after Substantial Completion and caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage.
- 3.5.2 The Contractor shall be responsible for determining that all materials furnished for the Work meet all requirements of the Contract Documents. The Architect may require the Contractor to produce reasonable evidence that a material meets such requirements, such as certified reports of past tests by qualified testing laboratories, reports of studies by qualified experts, or other evidence which, in the opinion of the Architect, would lead to a reasonable certainty that any material used, or proposed to be used in the Work, meets the requirements of the Contract Documents. All such data shall be furnished at the Contractor's expense. This provision shall not require the Contractor to pay for periodic testing of different batches of the same material, unless such testing is specifically required by the Contract Documents to be performed at the Contractor's expense.
- 3.5.3 If the Contractor proposes to use a material which, while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, the Contractor shall inform the Architect in writing of the nature of such deviations at the time the material is submitted for approval, and shall request written approval of the deviation from the requirements of the Contract Documents, in accordance with the procedures set forth in Mass. Gen. Laws Chapter 30, Section 39I.
- 3.5.4 In requesting approval of deviations or substitutions, the Contractor shall provide, upon request, evidence leading to a reasonable certainty that the proposed substitution or

deviation meets or exceeds the requirements set forth in Mass. Gen. Laws Chapter 30, Section 39M(b). If, in the opinion of the Architect, the evidence presented by the Contractor does not provide a sufficient basis for such reasonable certainty, the Architect may reject such substitution or deviation.

- 3.5.5 The Contract Documents are intended to produce a building of consistent character and quality of design. All components of the building including visible items of mechanical and electrical equipment have been selected to have a coordinated design in relation to the overall appearance of the building. The Architect shall judge the design and appearance of proposed substitutes on the basis of their suitability in relation to the overall design of the Project, as well as for their intrinsic merits. The Architect will not approve as equal to materials specified proposed substitutes which, in the Architect's opinion, would be out of character, obtrusive, or otherwise inconsistent with the character or quality of design of the Project. In order to permit coordinated design of color and finishes the Contractor shall, if required by the Architect, furnish the substituted material in any color, finish, texture, or pattern which would have been available from the manufacturer originally specified, at no additional cost to the Owner.
- 3.5.6 Any additional cost, or any loss or damage arising from the substitution of any material or any method for those originally specified shall be borne by the Contractor, notwithstanding approval or acceptance of such substitution by the Owner or the Architect, unless such substitution was made at the written request or direction of the Owner or the Architect.
- 3.5.7 The warranty provided in this paragraph 3.5 shall be in addition to and not in limitation of any other warranty required by the Contract Documents or otherwise prescribed by law.
- 3.5.8 The Contractor shall procure and deliver to the Architect, no later than the date claimed by the Contractor as the date of Substantial Completion, all special warranties required by the Contract Documents. Delivery by the Contractor shall constitute the Contractor's guarantee to the Owner that the warranties shall be performed in accordance with their terms and conditions.

3.6 TAXES

3.6.1 The Contractor shall pay sales, consumer, use and similar taxes for the Work or portions thereof provided by the Contractor which are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

3.7 PERMITS, FEES AND NOTICES

3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit and other permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required when bids are received or

negotiations concluded. Notwithstanding the foregoing, the Town hereby waives the fee for the Town's building permit for the Project.

- 3.7.2 The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authorities bearing on performance of the Work.
- 3.7.3 It is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations. However, if the Contractor observes that portions of the Contract Documents are at variance therewith, the Contractor shall promptly notify the Architect and Owner in writing, and necessary changes shall be accomplished by appropriate Modification.
- 3.7.4 If the Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, and rules and regulations without such notice to the Architect and Owner, the Contractor shall assume full responsibility for such Work and shall bear the attributable costs.
- 3.8 ALLOWANCES
- 3.8.1-3.8.2 OMITTED.
- 3.9 SUPERINTENDENCE
- 3.9.1 The Contractor shall employ a competent superintendent, acceptable to the Owner, and necessary assistants who shall be in attendance at the Project site full time during the progress of the Work until the date of Substantial Completion, and for such additional time thereafter as the Architect may determine to be necessary for the expeditious completion of the Work. The superintendent shall be licensed to act as superintendent in accordance with all applicable laws for projects of this type. The Contractor shall remove the superintendent if requested to do so in writing by the Owner, and shall promptly replace him with a competent person reasonably acceptable to the Owner. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.
- 3.9.2 The Contractor shall retain a competent Registered Professional Engineer or Registered Land Surveyor, acceptable to the Architect, who shall establish the exterior lines and required elevations of all buildings and structures to be erected on the site and shall establish sufficient lines and grades for the construction of associated Work such as, but not limited to, roads, utilities and site grading. The Engineer or Land Surveyor shall certify as to the actual location of the constructed facilities in relation to property lines, building lines, easements, and other restrictive boundaries.
- 3.9.3 The Contractor shall establish the building grades, lines, levels, column, wall and partition lines required by the various Subcontractors in laying out their Work.
- 3.9.4 The Contractor shall coordinate and supervise the Work performed by Subcontractors to the end that the Work is carried out without conflict between trades and so that

no trade, at any time, causes delay to the general progress of the Work. If such delays occur, the Owner may deduct anticipated liquidated damages from the Progress Payments to the Contractor. The Contractor and all Subcontractors shall at all times afford each trade, any separate contractor, or the Owner, every reasonable opportunity for the installation of Work and the storage of materials.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

3.10.1 The Contractor shall prepare and submit to the Architect a progress schedule, and shall comply with such schedule, as described in Subparagraphs 8.2.4 through 8.2.8.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

3.11.1 The Contractor shall maintain at the site for the Owner one record copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record changes and selections made during construction, and in addition approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.
- 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the work.
- 3.12.3 Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.
- 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the Architect is subject to the limitations of this Paragraph 3.12 and Paragraph 4.2.
- 3.12.5 The Contractor shall review, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness, in accordance with the Contractor's progress schedule approved by the Architect, and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals made by the Contractor which are not required by the Contract Documents may be returned without action.

- 3.12.6 The Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been reviewed by the Architect. Such Work shall be in accordance with reviewed and approved submittals.
- 3.12.7 By approving and submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor thereby represents that the Contractor has determined and verified all dimensions, quantities, field dimensions, relations to existing work, coordination with work to be installed later, coordination with information on previously accepted Shop Drawings, Product Data, Samples, or similar submittals and verification of compliance with all the requirements of the Contract Documents. The accuracy of all such information is the responsibility of the Contractor. In reviewing Shop Drawings, Product Data, Samples, and similar submittals the Architect shall be entitled to rely upon the Contractor's representation that such information is correct and accurate.
- 3.12.8 The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's review of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's review thereof.
- 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. Unless such notice has been given, the Architect's review of a resubmitted Shop Drawing, Product Date, Sample, or similar submittal shall not constitute acceptance of any changes not requested on the prior submittal.
- 3.12.10 Informational submittals upon which the Architect is not expected to take responsible action may be so identified in the Contract Documents.
- 3.12.11 When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the Owner shall be entitled to rely upon such certifications, and neither the Owner nor the Architect shall be expected to make any independent examination with respect thereto.
- 3.12.12 The Architect will not check dimensions or quantities on any Shop Drawings and will not assume any responsibility for any errors in dimensions or quantities on Shop Drawings.
- 3.13 USE OF SITE
- 3.13.1 The right of possession of the premises and the improvements made thereon by the Contractor shall remain at all times in the Owner. The Contractor's right to entry and use thereof arises solely from the permission granted by the Owner under the Contract Documents. The Contractor shall confine the Contractor's apparatus, the storage of materials and the

operations of the Contractor's workers to limits indicated by law, ordinances, the Contract Documents and permits and/or directions of the Architect, and shall not unreasonably encumber the premises with the Contractor's materials. The Owner shall not be liable to the Contractor, the Subcontractors, their employees or anyone else with respect to the conditions of the premises, except only for a condition caused directly and solely by the negligence of the Owner.

3.14 CUTTING AND PATCHING

- 3.14.1 The Contractor and its Subcontractors shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly, all to be performed in accordance with the requirements of the Contract Documents.
- 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

3.15 CLEANING UP

- 3.15.1 The Contractor daily shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work the Contractor shall remove from and about the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials. Immediately prior to the Architect's inspection for Substantial Completion, the Contractor shall completely clean the premises. Concrete and ceramic surfaces shall be cleaned and washed. Resilient coverings shall be cleaned, waxed and buffed. Woodwork shall be dusted and cleaned. Sash, fixtures and equipment shall be thoroughly cleaned. Stains, spots, dust, marks and smears shall be removed from all surfaces. Hardware and all metal surfaces shall be cleaned and polished. Glass and plastic surfaces shall be thoroughly cleaned by professional window cleaners. All damaged, broken or scratched glass or plastic shall be replaced by the Contractor at the Contractor's expense.
- 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.
- 3.15.3 The provisions of paragraphs 3.15.1 and 3.15.2 shall apply equally to all subcontractors at the project insofar as each subcontractor's work is concerned.

3.16 ACCESS TO WORK

3.16.1 The Contractor shall provide the Owner and Architect access to the work in preparation and progress wherever located.

3.17 ROYALTIES AND PATENTS

3.17.1 The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

3.18 INDEMNIFICATION

- 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expense, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including loss of use resulting therefrom, caused in whole or in part by negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph 3.18.
- 3.18.2 In claims against any person or entity indemnified under this Paragraph 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Paragraph 3.18 shall not be limited by a limitation on the amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' or workmen's compensation acts, disability benefit acts, or other employee benefit acts.
- 3.18.3 The obligations of the Contractor under this Paragraph 3.18 shall not extend to the liability of the Architect, the Architect's consultants, and agents and employees of any of them arising out of (1) the preparation of maps, Drawings, opinions, reports, surveys, Change Orders, designs or Specifications, or (2) directions or instructions given by the Architect, the Architect's consultants, and agents or employees of any of them.

3.19 COVENANT NOT TO SUE

3.19.1 In consideration of the Contractor's undertaking to indemnify and hold harmless the Architect, the Architect's consultants and agents or employees of any of them, in accordance with Paragraph 3.18, agree that the Architect will not bring any civil suit, action or other proceeding in law, equity or arbitration against the Contractor, or the officers, employees, agents and servants of the Contractor, for or on account of any action which the Architect may have arising out of or in any manner connected with the Work, except to enforce the provisions of

Paragraph 3.18 and this Paragraph 3.19; and the Contractor, or any successor, assign or subrogee of the Contractor, agrees not to bring any civil suit, action or other proceeding in law, equity or arbitration against the Architect, or the officers, employees, agents and servants of the Architect, for the enforcement of any action which the Contractor may have arising out of or in any manner connected with the Work.

3.20 RECORD KEEPING REQUIREMENTS

3.20.1 The Contractor shall comply with all applicable requirements of Mass. Gen. Laws Chapter 30, Section 39R.

ARTICLE 4

ADMINISTRATION OF THE CONTRACT

4.1 ARCHITECT

- 4.1.1 The Architect is the person lawfully licensed to practice architecture or an entity lawfully practicing architecture identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Architect" means the Architect or the Architect's authorized representative.
- 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld. To the extent inconsistent herewith, the rights and responsibilities of the Architect shall be governed by the Owner/Architect Agreement for the Project.
- 4.1.3 In case of termination of employment of the Architect, the Owner shall appoint an architect whose status under the Contract Documents shall be that of the former architect.

4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

- 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents. The Architect will advise and consult with the Owner. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified by written instrument in accordance with other provisions of the Contract.
- 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the completed Work and to determine in general if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents. The Architect will visit the site at least once per week during periods of active construction. The Architect will not be required to make exhaustive or continuous on-site inspections to check quality or quantity of the Work. On the basis of on-site observations as an architect, the Architect will keep the Owner informed

of progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work.

- 4.2.3 The Architect will not have control over or charge of and will not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility as provided in Paragraph 3.3. The Architect will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Architect will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or of any other persons performing portions of the Work.
- 4.2.4 Communications Facilitating Contract Administration. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate through the Project Manager. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers generally shall be through the Contractor, although the Owner and Project Manager may have direct communications with subcontractors and suppliers intended to facilitate or expedite construction. Communications by and with separate contractors shall be through the Owner.

As to any written communications between two of the three of the Owner, Architect, and Contractor, a concurrent copy shall be sent to the third.

- 4.2.5 The Architect will have authority to reject Work which does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable for implementation of the intent of the Contract Documents, the Architect will have authority to require additional inspection or testing of the Work in accordance with Subparagraphs 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the Work.
- 4.2.6 In accordance with generally accepted standards of professional practice the Architect will review, approve, and take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, for the purpose of checking for conformance with the Contract Documents. The Architect's action will be taken with reasonable promptness, while allowing sufficient time in the Architect's professional judgment to permit adequate review, and in any event shall take no longer than the time permitted by law. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of obligations set forth in Paragraphs 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods,

techniques, sequences or procedures. The Architect's action with respect to any specific item shall not indicate approval of an assembly of which the item is a component.

- 4.2.7 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Paragraph 7.4.
- 4.2.8 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion, will receive and forward to the Owner for the Owner's review and records written warranties and related documents required by the Contract and assembled by the Contractor, and will issue a final Certificate for Payment upon compliance with the requirements of the Contract Documents.
- 4.2.9 If the Owner and Architect agree in writing, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents. If no such exhibit has been so incorporated, the duties, responsibilities, and limitations of authority of such project representatives shall be as set forth in the edition of AIA Document B352 current as of the date of the Agreement.
- 4.2.10 The Architect will interpret and decide matters concerning performance under and requirements of the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made with reasonable promptness and within any time limits agreed upon. The Architect may, as the Architect judges desirable, issue additional drawings or instructions indicating in greater detail the construction or design of the various parts of the Work; such drawings or instructions may be effected by field order or other notice to the Contractor, and provided such drawings or instructions are reasonably consistent with the previously existing Contract Documents, the Work shall be executed in accordance with such additional drawings or instructions without additional cost or extension of the Contract Time. If the Contractor claims additional cost or time on account of such additional drawings or instructions, the Contractor shall give the notice provided in Subparagraph 4.3.7.
- 4.2.11 Interpretations and decisions of the Architect will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by the Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions so rendered in good faith.
- 4.2.12 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

4.3 CLAIMS AND DISPUTES

4.3.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" includes Change

Order requests by the Contractor as well as other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be made by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.

- 4.3.2 Decision of Architect. Claims arising prior to final payment or the earlier termination of the Contract shall be referred initially to the Architect for action as provided in Paragraph 4.4. Action by the Architect, as provided in Paragraph 4.4, shall be required as a condition precedent to arbitration of a Claim between the Contractor and Owner as to all such matters arising prior to the date final payment is due. Action by the Architect in response to a Claim shall not be a condition precedent to arbitration in the event (1) the position of Architect is vacant; (2) the Architect has failed to take action as required under Subparagraph 4.4.1 within 15 days after the Claim is made; (3) the Architect has failed to take action required under Subparagraph 4.4.4 within 30 days after the Claim is made, unless the Architect has notified the parties in writing of the reasons why action could not be taken within 30 days, and of the date by which action will be taken; or (4) the Claim relates to a mechanic's lien.
- 4.3.3 Time Limits on Claim. Claims by either party must be made within 35 days after occurrence of the event giving rise to such Claim or within 35 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims must be made by written notice. Any change or addition to a previously made Claim shall be made by timely written notice in accordance with this Subparagraph 4.3.3.
- 4.3.4 Continuing Contract Performance. Pending final resolution of a Claim including arbitration, unless otherwise agreed in writing the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.
- 4.3.5 Waiver of Claims: Final Payment. The making of final payment shall constitute a waiver of Claims by the Owner except those arising from:
 - .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
 - .2 failure of the Work to comply with the requirements of the Contract Documents; or
 - .3 terms of special warranties required by the Contract Documents.

Any Claim which has not been waived in accordance with this Subparagraph shall be deemed to have accrued upon discovery by the Owner of the condition or breach upon which such Claim is based, for the purpose of any applicable statute of limitation.

4.3.6 Claims for Differing Subsurface or Latent Physical Conditions. If, during the progress of the Work, the Contractor or the Owner discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the plans or indicated in the Contract Documents, either the Contractor or the Owner may request

an equitable adjustment in the Contract Sum applying to Work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a Contractor, or upon its own initiative, the Owner shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the Contract Documents or from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in the plans and Contract Documents and are of such a nature as to cause an increase or decrease in the cost of performance of the Work or a change in the construction methods required for the performance of the Work which results in an increase or decrease in the cost of the Work, the Owner shall make an equitable adjustment in the Contract Sum and the Contract shall be modified in writing accordingly.

- 4.3.6.1 Should conditions encountered below the surface of the ground require that footings, foundations or other parts of the building or other structure be raised, lowered or changed, or if additional depth of excavation below the levels shown on the Drawings is required in order to provide proper bearing for the building or other structure or for any permanent utilities on the site or for permanent grading or other permanent site work, any change in the amount of excavation, dewatering, sheeting, protection, rock excavation, backfill, concrete or other structural work, or any other work permanently incorporated in the building shall be considered a change in the Work, and the Contract Sum shall be adjusted as provided in this Article, provided that the Work has been ordered in writing as provided in 7.1.1.
- 4.3.7 Claims for Additional Cost or Time. If the Contractor claims that any acts or omissions of the Owner or the Architect, including any instructions or orders, whether oral, written, by Drawings, or otherwise, involve extra cost or time, and the Contractor has not received a written acknowledgment by the Owner or Architect that extra payment will be made or time extended on account thereof, the Contractor shall promptly so notify the Architect in writing of such Claim and shall not proceed with the Work relating to such Claim until the Contractor has received a further written order to proceed except, as provided in Paragraph 10.3, in the case of an emergency affecting life or property. No Claim by the Contractor on account of such acts, omissions, instructions or orders shall be valid unless the Contractor has so notified the Architect before proceeding, and has received the further written order to proceed.

4.3.7.1 OMITTED

- 4.3.7.2 The Contractor shall have the burden of demonstrating the effect of the claimed act or omission on the Contract Sum or Contract Time, and shall furnish the Architect with such documentation relating thereto as the Architect may reasonably require. In the case of a continuing act or omission only one Claim is necessary.
- 4.3.7.3 Adverse weather conditions shall not be the basis for a Claim for additional time or cost.
- 4.3.8 Injury or Damage to Person or Property. If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, of any of

the other party's employees or agents, or of others for whose acts such party is legally liable, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter. If a Claim for additional cost or time related to this Claim is to be asserted, it shall be filed as provided in Subparagraph 4.3.7.

4.4 REVIEW OF CLAIMS BY ARCHITECT

- 4.4.1 The Architect shall take one or more of the following actions within ten days of receipt of a Claim: (1) defer any action with respect to all or any part of a Claim and request additional information from either party; (2) decline to render a decision for any reason which he deems appropriate (including but not limited to the fact that the Claim involves allegations of fault on the part of the Architect); (3) render a decision on all or a part of the Claim, or (4) submit a schedule to the parties indicating when the Architect expects to take action. The Architect shall notify the parties in writing of any action taken with respect to such Claim. If the Architect renders a decision or declines to render a decision, either party may proceed in accordance with Paragraph 4.5. If the Architect decides that the Work relating to such Claim should proceed regardless of his disposition of such Claim, the Architect shall issue to the Contractor a written order to proceed. The Contractor shall proceed as instructed, and all rights of both parties with respect to such Claim shall be deemed to have been reserved.
- 4.4.2 If a Claim is resolved by agreement of the parties, the Architect will prepare or obtain appropriate documentation indicating the parties' agreement to the resolution. In the absence thereof the Claim shall be treated as not resolved.
- 4.4.3 If a Claim has not been resolved, the party making the Claim shall, within ten days after the Architect's request, take one or more of the following actions: (1) submit additional supporting data requested by the Architect; (2) modify the initial Claim; (3) respond to the Architect's action under paragraph 4.4.1; or (4) notify the Architect that the initial Claim stands. Upon receipt of the response or supporting data, the Architect will either reject or approve the claim in whole or in part.

4.5 ARBITRATION

4.5.1 Controversies and Claims Subject to Arbitration. Any Claim arising out of or related to the Contract, or the breach thereof, except claims relating to aesthetic effect, shall be settled by arbitration, subject to the foregoing provisions of paragraph 4.4 and the provisions of Subparagraph 4.5.7. Arbitration will be conducted in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association and judgment upon the award rendered by the Arbitrator or Arbitrators may be entered in any Court having jurisdiction thereof. In any such arbitration in which the amount stated in the demand is \$100,000 or less, a single arbitrator shall be appointed in accordance with the procedures set forth in the American Arbitration Association Construction Industry Arbitration Rules. In any such arbitrators shall be appointed in accordance with the procedures set forth in the American Arbitration Association Construction Industry Arbitration Rules.

4.5.2 Rules For Arbitration. The parties may agree to any arbitration forum. If unable to agree, by default the forum shall be the American Arbitration Association. If the neutral arbitrator(s) is/are appointed by the American Arbitration Association, the said Association shall administer the arbitration and its Construction Industry Arbitration Rules shall govern all aspects of the proceeding including the enforcement of any award. If the neutral arbitrator(s) is/are not appointed by the American Arbitration Association, then the arbitrator(s) shall act as the administrator of the arbitration but the Construction Industry Arbitration Rules of the Association shall nonetheless govern all aspects of the proceeding, including the enforcement of any award. The arbitration panel shall have all of the powers and duties conferred on the Association pursuant to said rules.

In addition, the following rules shall govern the selection of arbitrators and the proceedings:

- 4.5.2.1 Neither party may appoint as arbitrator an employee or an owner of that party, nor the parent, spouse or child of an employee or owner of that party.
- 4.5.2.2 After the neutral arbitrator has been appointed, neither party may engage in ex parte communication with the arbitrator appointed by that party.
- 4.5.3 Contract Performance During Arbitration. During arbitration proceedings, the Owner and Contractor shall comply with Subparagraph 4.3.4.
- 4.5.4 When a written decision of the Architect states that the decision is final, any demand for arbitration of the matter covered by such decision must be made within two months after substantial completion of the project, as determined by the Architect in accordance with paragraph 9.8.2 hereof. The failure to demand arbitration within said two month period will result in the Architect's decision becoming final and binding upon the Owner and the Contractor.
- 4.5.4.1 A demand for arbitration shall be made within the time limits specified in Subparagraph 4.5.4, and in no event shall be made after the date when the institution of legal or equitable proceedings based on such Claim would be barred by the applicable statute of limitations.
- 4.5.5 Claims and Timely Assertion of Claims. A party who files a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded. When a party fails to include a Claim through oversight, inadvertence or excusable neglect, or when a Claim has matured or been acquired subsequently, the arbitrator or arbitrators may permit amendment.
- 4.5.6 Judgment on Final Award. The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

- 4.5.7 Notwithstanding any provision contained in this Paragraph 4.5 or elsewhere in the Contract Documents, the Owner reserves the following rights in connection with Claims and disputes between the Owner and the Contractor:
 - .1 the right to institute legal action against the Contractor in any court of competent jurisdiction in lieu of demanding arbitration pursuant to this Paragraph 4.5, in which case the dispute or disputes which are the subject of such action shall be decided by such court, and not by arbitration;
 - .2 the right to obtain from any court of competent jurisdiction a stay of any arbitration instituted by the Contractor, provided that the application for such stay is made before the appointment of the neutral arbitrator in such arbitration, in which case the dispute or disputes which are the subject of such arbitration shall be decided by such court, and not by arbitration;
 - .3 the right to require the Contractor to join as a party in any arbitration between the Owner and the Architect relating to the Project, in which case the Contractor agrees to be bound by the decision of the arbitrator or arbitrators in such arbitration.

In case the Owner elects to proceed in accordance with 4.5.7.1 or 4.5.7.2 above, the word "litigation" shall be deemed to replace the word "arbitration" wherever the latter word appears in the Contract Documents.

ARTICLE 5

SUBCONTRACTORS

5.1 DEFINITIONS

- 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or Subcontractors of a separate contractor.
- 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.
- 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK
- 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the

Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect will promptly reply to the Contractor in writing stating whether or not the Owner or the Architect, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Owner or Architect to reply promptly shall constitute notice of no reasonable objection.

- 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection, unless otherwise required by law to do so.
- 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. The Contract Sum shall be increased or decreased by the difference in cost occasioned by such change and an appropriate Change Order shall be issued. However, no increase in the Contract Sum shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.
- 5.2.4 The Contractor shall not change a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such change.
- 5.2.5 The form of each filed Subcontract shall be submitted to the Owner for its acceptance, which shall not be unreasonably withheld or delayed. The form of subcontract shall be that set forth in Mass. Gen. Laws Chapter 149, Section 44F. Each Subcontract shall expressly provide for the contingent assignment referred to in Paragraph 5.4.

5.3 SUBCONTRACTUAL RELATIONS

5.3.1 By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward the Owner and Architect, including without limitation the obligations set forth in Paragraph 3.18. Each Subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that Subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the Subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Subsubcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the Subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed Subcontract agreement which may be at

variance with the Contract Documents. Subcontractors shall similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

- 5.4.1 Each Subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner provided that:
 - .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Paragraph 14.2 and only for those Subcontract agreements which the Owner accepts by notifying the Subcontractor in writing; and
 - assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

ARTICLE 6

CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTS

6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

- 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these, including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided elsewhere in the Contract Documents.
- 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.
- 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their progress schedules when directed to do so. The Contractor shall make any revisions to the progress schedules and Contract Sum deemed necessary after a joint review and mutual agreement. The progress schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

6.2 MUTUAL RESPONSIBILITY

- 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.
- 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgement that the Owner's or separate contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonable discoverable.
- 6.2.3 Costs caused by delays or by improperly timed activities or defective construction shall be borne by the party responsible therefor.
- 6.2.4 The Contractor shall promptly remedy damage wrongfully caused by the Contractor to completed or partially completed construction or to property of the Owner or separate contractors as provided in Subparagraph 10.2.5. If such separate contractor sues or initiates an arbitration proceeding against the Owner on account of any damage alleged to have been caused by the Contractor, the Owner shall notify the Contractor, who shall defend such proceedings at the Contractor's expense, and if any judgment or award against the Owner arises therefrom the Contractor shall pay or satisfy it and shall reimburse the Owner for all attorneys' fees and court or arbitration costs which the Owner has incurred.
- 6.2.5 Claims and other disputes and matters in question between the Contractor and a separate contractor shall be subject to the provisions of Paragraph 4.3 provided the separate contractor has reciprocal obligations.
- 6.2.6 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Paragraph 3.14.

6.3 OWNER'S RIGHT TO CLEAN UP

6.3.1 If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish as described in Paragraph 3.15, the Owner may clean up and allocate the cost among those responsible as the Architect determines to be just.

ARTICLE 7

CHANGES IN THE WORK

7.1 CHANGES

- 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.
- 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.
- 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.
- 7.1.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are so changed in a proposed Change Order or Construction Change Directive that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

7.2 CHANGE ORDERS

- 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect, stating their agreement upon all of the following:
 - .1 a change in the Work;
 - .2 the amount of the adjustment in the Contract Sum, if any; and
 - .3 the extent of the adjustment in the Contract Time, if any.

7.3 CONSTRUCTION CHANGE DIRECTIVES

- 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.
- 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

- 7.3.3 Upon request of the Owner or the Architect, the Contractor shall without cost to the Owner submit to the Architect, in such form as the Architect may require, an accurate written estimate of the cost of any proposed extra Work or change contemplated by a Construction Change Directive. The estimate shall indicate the quantity and unit cost of each item of materials, and the number of hours of work and hourly rate for each class of labor, as well as the description and amounts of all other costs chargeable under the terms of this Article. Unit labor costs for the installation of each item of materials shall be shown if required by the Architect. The Contractor shall promptly revise and resubmit such estimate if the Architect determines that it is not in compliance with the requirements of this Article, or that it contains errors of fact or mathematical errors. If required by the Architect, in order to establish the exact cost of new Work added or of previously required Work omitted, the Contractor shall obtain and furnish to the Architect bona fide proposals from recognized suppliers for furnishing any material included in such Work. Such estimates shall be furnished promptly so as to occasion no delay in the Work, and shall be furnished at the Contractor's expense. The Contractor shall state in the estimate any extension of time required for the completion of the Work if the change or extra work is ordered.
- 7.3.3.1 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods, as selected by the Owner:
 - (a) By unit prices stated in the Contract Documents or otherwise mutually agreed upon.
 - (b) By Cost and Percentages (as defined below) estimated by the Contractor as provided in Subparagraph 7.3.3 and accepted by the Owner; the Contractor's estimate shall become a fixed price which shall not be changed by any variation in the actual cost of executing the Work covered by the change.
 - (c) By actual Cost determined after the Work covered by the change is completed, plus Percentage.
 - (d) By use of the dispute resolution procedures set forth in Paragraph 4.3.

As used in this Paragraph 7.3, "Cost" shall mean the estimated or actual net increase or decrease in cost to the Contractor, Subcontractor, or Sub-subcontractor for performing the Work covered by the change, including actual payments for materials, equipment, rentals, expendable items, wages and associated benefits to workmen and to supervisors employed full time at the site, insurance, bonds and other provable direct costs, but not including any administrative, accounting or expediting costs, or other indirect or overhead costs, or any wages or benefits of supervisory personnel not assigned full time to the site, or any amount for profit or fee to the Contractor, Subcontractor or Sub-subcontractor.

"Percentage" shall mean an allowance to be added to or subtracted from the Cost in lieu of overhead and profit and of any other expense which is not included in the Cost of the Work

covered by the change, as defined above. Percentage for a Sub-subcontractor shall be 10% of any net increase or decrease of Cost of any Work performed by the Sub-subcontractor's own forces plus 5% of any aggregate net increase in Cost of any Work performed for the Sub-subcontractor by other contractors. Percentage for a Subcontractor shall be such percentage allowances for overhead and profit as are set forth in the Subcontract between such Subcontractor and the Contractor. Percentage for the Contractor shall be 9 1/2% of any net increase or decrease of Cost of any Work performed by the Contractor's own forces plus 4 1/2% of any net increase or decrease in the Cost for all other Work covered by the change.

When in the reasonable judgment of the Architect a series of Construction Change Directives or Change Orders effect a single change, Percentage shall be calculated on the cumulative net increase or decrease in Cost, if any.

- 7.3.3.2 If the Owner elects to determine the cost of the Work as provided in method (a) of sub-Subparagraph 7.3.3.1, the unit prices shall be subject to Subparagraph 7.1.4. Notwithstanding the inclusion of unit prices in the Contract Documents, it shall be the Owner's option to require the Cost of any given change to be determined by one of the other methods stated in 7.3.3.1. If the Owner elects to determine the Cost of the change by unit prices and the nature of the work is such that its extent cannot readily be measured after the completion of such work or any subsequent work, the Contractor shall keep daily records, available at all times to the Architect for inspection, of the actual quantities of such work put in place, and delivery receipts or other adequate evidence, acceptable to the Architect, indicating the quantities of materials delivered to the site for use in such unit price work, and distinguishing such other similar material delivered for use in work included in the base Contract Sum. If so required by the Architect, materials for use in unit price work shall be stored apart from all other materials on the Project.
- 7.3.3.3 If the Owner elects to determine the cost of the Work as provided in methods (c) or (d) of sub-Subparagraph 7.3.3.1 or if the method of determining the cost has not been established before the Work is begun, the Contractor shall keep detailed daily records of labor and materials costs applicable to the Work.
- 7.3.4 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.
- 7.3.5 A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.
- 7.3.6 If the Owner and Contractor do not agree with the adjustment in Contract Sum or Contract Time or the method for determining the adjustment, the dispute shall be governed by the procedures set forth in Paragraph 4.3.

7.4 MINOR CHANGES IN THE WORK

7.4.1 The Architect will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

ARTICLE 8

TIME

8.1 DEFINITIONS

- 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.
- 8.1.2 The date of commencement of the Work is the date established in the Agreement. The date shall not be postponed by the failure to act of the Contractor or of persons or entities for whom the Contractor is responsible.
- 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Paragraph 9.8.
- 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

8.2 PROGRESS AND COMPLETION

- 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.
- 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor. The date of commencement of the Work shall not be changed by the effective date of such insurance. Unless the date of commencement is established by a notice to proceed given by the Owner, the Contractor shall notify the Owner in writing not less than five days or other agreed period before commencing the Work to permit the timely filing of mortgages, mechanic's liens and other security interests.
- 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

- 8.2.4 Within two weeks after award of the Contract, the Contractor shall submit to the Architect a Progress Schedule showing for each class of work the percentage completion to be obtained and the total dollar value of work to be completed as of the first of each month until Substantial Completion.
- 8.2.5 The Progress Schedule shall be based on an orderly progression of the Work, allowing adequate time for each operation (including adequate time for submission and review of submittals), and leading to a reasonable certainty of Substantial Completion by the date established in the Agreement. The Progress Schedule will be reviewed by the Architect for compliance with the requirements of this Article and will be accepted by the Architect or returned to the Contractor for revision and resubmittal. Unless specifically required by law, no payment under this Contract shall be due until the Progress Schedule has been approved by the Architect.
- 8.2.6 If in any application for payment as provided for in Paragraph 9.2, the total value of the completed Work in place, as certified by the Architect, is less than 90% of the total value of the Work in place estimated in the Progress Schedule, the Owner may, at the Owner's option, require the Contractor to accelerate the progress of the Work without cost to the Owner by increasing the work force or hours of work, or by other reasonable means approved by the Architect.
- 8.2.7 If each of three successive applications for payment indicate that the actual Work completed, as certified by the Architect, is less than 90% of the values estimated in the Progress Schedule to be completed by the respective dates, the Owner may at the Owner's option, treat the Contractor's delinquency as a default justifying the action permitted under Paragraph 14.2.
- 8.2.8 If the Architect has determined that the Contractor should be permitted to extend the time for completion as provided in Paragraph 8.3, the calendar dates in the Progress Schedule shall be adjusted accordingly to retain their same relationship to the adjusted date of Substantial Completion, and the dollar value of Work to be completed as of the first of each month shall be adjusted pro rata.
- 8.2.9 If the Contractor fails to submit any application for payment in any month, the Architect shall, for the purpose of this evaluation of progress, certify separately to the actual value of the Work in place completed as of the first of the month and to the best of the Architect's knowledge.
- 8.2.10 Nothing herein shall limit the Owner's right to liquidated or other damages for delays by the Contractor or to any other remedy which the Owner may possess under other provisions of the Contract Documents or by law.
- 8.2.11 The Progress Schedule required hereunder shall be a CPM Schedule in accordance with the Project Specifications and shall be updated in accordance therewith.

8.3 DELAYS AND EXTENSION OF TIME

- 8.3.1 If the Contractor is delayed at any time in progress of the Work by an act or neglect of the Owner or Architect, of an employee of either, or of a separate contractor employed by the Owner, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes (except weather) beyond the Contractor's control, or by delay authorized by the Owner, or by other causes which the Architect determines may justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.
- 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Paragraph 4.3.
- 8.3.3 The Contractor hereby agrees that the Contractor shall have no claim for damages of any kind against the Owner or the Architect on account of any delay in the commencement of the Work and/or any delay or suspension of any portion of the Work, whether such delay is caused by the Owner, the Architect, or otherwise, except as specifically provided in Subparagraphs 2.3.2 and 2.3.3. The Contractor acknowledges that, except as provided therein, the Contractor's sole remedy for any such delay and/or suspension will be an extension of time as provided in this Article.
- 8.3.4 No claim for delay shall be allowed on account of failure of the Architect to furnish Drawings, Specifications or instructions or to return Shop Drawings or Samples until the expiration of the applicable time period referred to in Mass. Gen. Laws Chapter 30, Section 39P, and not then unless such claim be reasonable.
- 8.3.5 No extension of time shall be granted because of seasonal or abnormal variations in temperature, humidity or precipitation, which conditions shall be wholly at the risk of the Contractor, whether occurring within the time originally scheduled for completion or within the period of any extension granted. There shall be no increase in the Contract Sum on account of any additional costs of operations or conditions resulting therefrom.

ARTICLE 9

PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the maximum amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents, or in equity, should the Contractor assert a quantum meruit claim for the fair value of Contractor's Work, regardless of whether the Contractor is terminated hereunder.

9.2 APPLICATIONS FOR PAYMENT

- 9.2.1 Within fifteen days after receipt from the Contractor, at the place designated by the Owner if such a place is so designated, of a periodic estimate requesting payment of the amount due for the preceding month, the Owner will make a periodic payment to the Contractor for the Work performed during the preceding month and for the materials not incorporated in the Work but delivered and suitably stored at the site (or at some location agreed upon in writing) to which the Contractor has title or to which a Subcontractor has title and has authorized the Contractor to transfer title to the Owner, less (1) retention based on the Owner's estimate of the fair value of its claims against the Contractor and less (2) a retention for direct payments to Subcontractors based on demands for same in accordance with the provisions of Subparagraph 9.6.2, and less (3) a retention not exceeding five percent of the approved amount of the periodic payment.
- 9.2.2 After the receipt of a periodic estimate requesting final payment and within sixtyfive days after (a) the Contractor fully completes the Work or substantially completes the Work so that the value of the Work remaining to be done is, in the estimate of the Owner, less than one percent of the original Contract Sum, or (b) the Contractor substantially completes the work and the Owner takes possession for occupancy, whichever occurs first, the Owner shall pay the Contractor the entire balance due on the Contract less (1) a retention based on its estimate of the fair value of its claims against the Contractor and the cost of completing the incomplete and unsatisfactory items of Work and less (2) a retention for direct payments to Subcontractors based on demands for same in accordance with the provisions of Subparagraph 9.6.2, or based on the record of payments by the Contractor to the Subcontractors under this Contract if such record of payment indicates that the Contractor has not paid Subcontractors as provided in Subparagraph 9.6.2. If the Owner fails to make payment as herein provided, there shall be added to each such payment daily interest at the rediscount rate then charged by the Federal Reserve Bank of Boston commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the Contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for final payment until fifteen days after receipt of such a periodic estimate from the Contractor, at the place designated by the Owner if such a place is so designated. The Contractor agrees to pay to each Subcontractor a portion of any such interest paid in accordance with the amount due each Subcontractor.
- 9.2.3 The Owner may make changes in any periodic estimate submitted by the Contractor, and the payment due on said periodic estimate shall be computed in accordance with the changes so made, but such changes or any requirement for a corrected periodic estimate shall not affect the due date for the periodic payment or the date for the commencement of interest charges on the amount of the periodic payment computed in accordance with the changes made, as provided herein; provided, that the Owner may, within seven days after receipt, return to the Contractor for correction, any periodic estimate which is not in the required form or which contains computations not arithmetically correct and, in that event, the date of receipt of such periodic estimate shall be the date of receipt of the corrected periodic estimate in proper form and with arithmetically correct computations. The date of receipt of a periodic estimate received on a Saturday, Sunday, or holiday shall be the first working day thereafter.

- 9.2.4 All periodic estimates shall be submitted to the Owner, or to the Owner's representative, and the date of receipt by the Owner or its representative shall be marked on the estimate. All periodic estimates shall contain a separate item for each filed subtrade and each sub-subtrade listed in sub-bid form as required by the Specifications and a column listing the amount paid to each Subcontractor and Sub-subcontractor as of the date the periodic estimate is filed. The person making payment for the Owner shall add the daily interest provided for herein to each payment for each day beyond the due date based on the date of receipt marked on the estimate.
- 9.2.5 The format and number of copies of applications for payment shall be as directed by the Architect. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and reflecting retainage if provided for elsewhere in the Contract Documents.
- 9.2.5.1 Such applications may include requests for payment on account of changes in the Work which have been properly authorized by Construction Change Directives but not yet included in Change Orders when such Construction Change Directives have set forth an adjustment to the Contract Sum.
- 9.2.5.2 Such applications may not include requests for payment of amounts the Contractor does not intend to pay to a Subcontractor or material supplier because of a dispute or other reason.
- 9.2.6 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.
- 9.3 The Contractor warrants that title to all Work covered by an application for payment will pass to the Owner either by incorporation in the construction or upon receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, claims, security interests or encumbrances, hereinafter referred to in this Article 9 as "liens."

9.4 CERTIFICATES FOR PAYMENT

9.4.1 The Architect will, within seven days after receipt of the Contractor's application for payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Subparagraph 9.5.1.

9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's observations at the site and the date comprising the application for payment, that the Work has progressed to the point indicated and that, to the best of the Architect's knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to minor deviations from the Contract Documents correctable prior to completion, and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

- 9.5.1 The Architect may decide not to certify payment and may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Subparagraph 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Subparagraph 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also decide not to certify payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss because of:
 - .1 defective Work not remedied;
 - .2 third party claims filed or reasonable evidence indicating probable filing of such claims:
 - .3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
 - .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum:
 - .5 damage to the Owner or another contractor;

- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the retainage currently held by the Owner would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 persistent failure to carry out the Work in accordance with the Contract Documents.
- 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

9.6 PROGRESS PAYMENTS

9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

9.6.2 Payments to Subcontractors

- 9.6.2.1 Forthwith after the Contractor receives payment on account of a periodic estimate, the Contractor shall pay to each Subcontractor the amount paid for the labor performed and the materials furnished by that Subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the Subcontractor by the Contractor.
- 9.6.2.2 Not later than the sixty-fifth day after each Subcontractor substantially completes his work in accordance with the plans and Specifications, the entire balance due under the Subcontract less amounts retained by the Owner as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the Subcontractor; and the Owner shall pay that amount to the Contractor. The Contractor shall forthwith pay to the Subcontractor the full amount received from the Owner less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the Subcontractor by the Contractor.
- 9.6.2.3 Each payment made by the Owner to the Contractor pursuant to Subparagraphs 9.6.2.1 and 9.6.2.2 of this paragraph for the labor performed and the materials furnished by a Subcontractor shall be made to the Contractor for the account of that Subcontractor; and the Owner shall take reasonable steps to compel the Contractor to make each such payment to each such Subcontractor. If the Owner has received a demand for direct payment from a Subcontractor for any amount which has already been included in a payment to the Contractor or which is to be included in a payment to the Contractor for payment to the Subcontractor as provided in Subparagraphs 9.6.2.1 and 9.6.2.2, the Owner shall act upon the demand as provided in this section.
- 9.6.2.4 If, within seventy days after the Subcontractor has substantially completed the Subcontract work, the Subcontractor has not received from the Contractor the balance due under the Subcontract including any amount due for extra labor and materials furnished to the

Contractor, less any amount retained by the Owner as the estimated cost of completing the incomplete and unsatisfactory items of Work, the Subcontractor may demand direct payment of that balance from the Owner. The demand shall be by a sworn statement delivered to or sent by certified mail to the Owner, and a copy shall be delivered to or sent by certified mail to the Contractor at the same time. The demand shall contain a detailed breakdown of the balance due under the Subcontract and also a statement of the status of completion of the Subcontract work. Any demand made after substantial completion of the Subcontract work shall be valid even if delivered or mailed prior to the seventieth day after the Subcontractor has substantially completed the Subcontract work. Within ten days after the Subcontractor has delivered or so mailed the demand to the Owner and delivered or so mailed a copy to the Contractor, the Contractor may reply to the demand. The reply shall be by a sworn statement delivered to or sent by certified mail to the Owner and a copy shall be delivered to or sent by certified mail to the Subcontractor at the same time. The reply shall contain a detailed breakdown of the balance due under the Subcontract including any amount due for extra labor and materials furnished to the Contractor and of the amount due for each claim made by the Contractor against the Subcontractor.

- 9.6.2.5 Within fifteen days after receipt of the demand by the Owner, but in no event prior to the seventieth day after substantial completion of the Subcontract work, the Owner shall make direct payment to the Subcontractor of the balance due under the Subcontract including any amount due for extra labor and materials furnished to the Contractor, less any amount (i) retained by the Owner as the estimated cost of completing the incomplete or unsatisfactory items of Work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the Contractor in the sworn reply; provided, that the Owner shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by Subparagraph 9.6.2.4. The Owner shall make further direct payments to the Subcontractor forthwith after the removal of the basis for deductions from direct payments made as provided in parts (i) and (ii) of this Subparagraph.
- 9.6.2.6 The Owner shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of Subparagraph 9.6.2.5 in an interest-bearing joint account in the names of the Contractor and the Subcontractor in a bank in Massachusetts selected by the Owner or agreed upon by the Contractor and the Subcontractor and shall notify the Contractor and the Subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the Contractor and the Subcontractor or as determined by decree of a court of competent jurisdiction.
- 9.6.2.7 All direct payments and all deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to Subparagraph 9.6.2.6 shall be made out of amounts payable to the Contractor at the time of receipt of demand for direct payment from a Subcontractor and out of amounts which later become payable to the Contractor and in the order of receipt of such demands from Subcontractors. All direct payments shall discharge the obligation of the Owner to the Contractor to the extent of such payment.
- 9.6.2.8 The Owner shall deduct from payments to the Contractor amounts which, together with the deposits in interest-bearing accounts pursuant to Subparagraph 9.6.2.6, are sufficient to

satisfy all unpaid balances of demands for direct payment received from Subcontractors. All such amounts shall be earmarked for such direct payments, and the Subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the Contractor.

- 9.6.2.9 If the Subcontractor does not receive payments as provided in Subparagraph 9.6.2.1 or if the Contractor does not submit a periodic estimate for the value of the labor or materials performed or furnished by the Subcontractor and the Subcontractor does not receive payment for same when due less the deductions provided for in Subparagraph 9.6.2.1, the Subcontractor may demand direct payment by following the procedure in Subparagraph 9.6.2.4 and the Contractor may file a sworn reply as provided in that same Subparagraph. A demand made after the first day of the month following that for which the Subcontractor performed or furnished the labor and materials for which the Subcontractor seeks payment shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the Contractor. Thereafter the Owner shall proceed as provided in Subparagraphs 9.6.2.5, 9.6.2.6, 9.6.2.7 and 9.6.2.8.
- 9.6.3 Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, Sub-subcontractor or material supplier, except as provided in Subparagraph 9.6.2, or otherwise as provided by law.
- 9.6.4 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.
- 9.6.5 "Subcontractor" as used in Sub–subparagraphs 9.6.2.1 through 9.6.2.9 shall mean a person who files a sub–bid and receives a subcontract as a result of that filed sub–bid or who is approved by the awarding authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the Contractor. "Subcontractor" as used in other provisions of the Contract Documents shall, except as otherwise expressly provided, have the meaning set forth in Subparagraph 5.1.1.

9.7 FAILURE OF PAYMENT

9.7.1 If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's application for payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended as provided in Article 7.

9.8 SUBSTANTIAL COMPLETION

9.8.1 Substantial Completion is the stage in the progress of the Work when the Work is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use and only minor items which can be corrected or completed

without any material interference with the Owner's use of the Work remain to be corrected or completed.

- 9.8.2 When the Contractor considers that the Work, or a portion thereof designated in the Contract Documents for separate completion, is substantially complete and the premises comply with Subparagraph 3.15.1, the Contractor shall submit to the Architect (1) a list of items to be completed or corrected, (2) all special warranties required by the Contract Documents, endorsed by the Contractor and in a form reasonably acceptable to the Architect and (3) the permits and certificates referred to in Subparagraph 13.5.4. The failure to include any items on the list mentioned in the preceding sentence does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. When the Architect on the basis of an inspection determines that the Work or designated portion thereof is substantially complete and the other conditions have been met, the Architect will then prepare a Certificate of Substantial Completion which shall establish the Date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to the Work, and insurance, and shall fix the time within which the Contractor shall complete the items listed therein. Warranties required by the Contract Documents shall commence on the date of Substantial Completion. The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of the responsibilities assigned to them in such Certificate.
- 9.8.3 Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor and certification by the Architect, the Owner shall make payment, reflecting adjustment in retainage, if any, for such Work or portion thereof as provided in the Contract Documents.

9.9 PARTIAL OCCUPANCY OR USE

- 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage. Such partial occupancy or use may begin whether or not the portion is substantially complete, provided that the respective responsibilities of the Owner and Contractor with respect to payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work, insurance, correction of the Work, and warranties shall be established by agreement of the Owner and Contractor or, absent such agreement, shall be determined by the Architect subject to the right of either party to contest such determination as provided in Paragraph 4.5.
- 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.
- 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

9.10 FINAL COMPLETION AND FINAL PAYMENT

- 9.10.1 Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final application for payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's observations and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Subparagraph 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.
- 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.
- 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims. The making of final payment shall constitute a waiver of claims by the Owner to the extent provided in Subparagraph 4.3.5.
- 9.10.4 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing

and identified by that payee as unsettled at the time of final application for payment. Such waivers shall be in addition to the waiver described in Subparagraph 4.3.5.

ARTICLE 10

PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

10.2 SAFETY OF PERSONS AND PROPERTY

- 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to:
 - .1 employees performing the Work and other persons who may be affected thereby;
 - .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors:
 - .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction; and
 - .4 any other property of the Owner, whether or not forming part of the Work, located at the site or adjacent thereto in areas to which the Contractor has access.
- 10.2.2 The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.
- 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.
- 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

- 10.2.5 The Contractor shall promptly remedy damage and loss to property referred to in Clauses 10.2.1.2, 10.2.1.3 and 10.2.1.4. If the damage or loss is due in whole or in part to the Contractor's failure to take the precautions required by this Paragraph 10.2, the Contractor shall, subject to any reimbursement to which the Contractor is entitled under the property insurance required by the Contract Documents, bear the cost.
- 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.
- 10.2.7 The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.
- 10.2.8 The Contractor shall provide and maintain in good operating condition suitable and adequate fire protection equipment and services, and shall comply with all reasonable recommendations regarding fire protection made by the representatives of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits shall be kept orderly and clean, and all combustible rubbish shall be promptly removed from the site.
- 10.2.9 The Contractor shall at all time protect excavations, trenches, buildings and materials, from rain water, ground water, backup or leakage of sewers, drains and other piping, and from water of any other origin and shall remove promptly any accumulation of water. The Contractor shall provide and operate all pumps, piping and other equipment necessary to this end.
- 10.2.10 The Contractor shall remove snow and ice which might result in damage or delay.
- During the progress of the Work and at all times prior to the date of Substantial Completion or occupancy of the Work by the Owner, whichever is earlier, the Contractor shall provide temporary heat, ventilation, and enclosure, as required by Mass. Gen. Laws Chapter 149, Section 44F(1). The permanent heating and ventilation systems may be used for these purposes when available unless otherwise provided in the Contract Documents.

10.3 EMERGENCIES

10.3.1 In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Paragraph 4.3 and Article 7.

10.4 VANDALISM

10.4.1 The Contractor shall be responsible for protecting the work, the work site, materials, and equipment stored at the site (or incorporated in the work), other property at the

site, or other property of the Owner, against vandalism by known or unknown persons. In discharging this obligation the Contractor shall utilize security personnel, measures, procedures, and equipment or materials necessary to prevent vandalism.

- 10.4.2 In the event of any damage caused by vandalism to the property/materials/ equipment/items referenced in the preceding Article 10.4.1, and regardless of whether the Contractor has exercised due care in avoiding same, the Contractor shall be financially responsible therefor to whatever extent said damage is not indemnified by insurance coverage available to either the Contractor or Owner. The Contractor's obligation hereunder shall include payment of damages to whatever extent insurance coverage is unavailable due to self–insurance, a deductible, or a self–insured retention.
- 10.4.3 Any monies owed by the Contractor to the Owner on account of damages referenced in the preceding Article 10.4.2 may be offset by the Owner against any periodic payments made under the Contract.

ARTICLE 11

INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

- 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located and to which the Owner has no reasonable objection such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:
 - .1 claims under workers' or workmen's compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;
 - .2 claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
 - .3 claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
 - .4 claims for damages insured by usual personal injury liability coverage which are sustained (1) by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor, or (2) by another person;

- .5 claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle; and
- .7 claims involving contractual liability insurance applicable to the Contractor's obligations under Paragraph 3.18.
- 11.1.2 The insurance required by Subparagraph 11.1.1 shall include all major divisions of coverage, and shall be on a comprehensive general basis including Premises and Operations (including X-C-U), Owner's and Contractor's Protective, Products and Completed Operations, and Owned, Nonowned, and Hired Motor Vehicles. Such insurance shall be written for not less than any limits of liability required by law or those set forth in the Contract Documents, whichever is greater.

All insurance shall be written on an occurrence basis, unless the Owner approves in writing coverage on a claims-made basis. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until date of final payment and termination of any coverage required to be maintained after final payment. The Owner shall be added as an Additional Insured on all policies, which shall constitute primary insurance for the Owner in relation to any similar or concurrent insurance independently maintained by the Owner.

- 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These Certificates and the insurance policies required by this Paragraph 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. These certificates shall set forth evidence of all coverage required by 11.1.1 and 11.1.2. The form of certificate shall be AIA Document G705. The Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending limits of coverage. If any of the foregoing insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final application for payment as required by Subparagraph 9.10.2.
- 11.1.4 In addition to Statutory Workers' Compensation Coverage, the Contractor shall provide Employers Liability Coverage at the following limits of liability:

Each accident - \$500,000;

Disease - policy limit \$500,000;

Disease - each employee \$500,000.

11.1.5 The liability insurance coverage purchased by the Contractor in order to comply with Section 11.1.1 (.1-.7) above shall contain the following limits of liability:

\$3,000,000 - general aggregate;

\$3,000,000 - products/completed operations aggregate;

\$1,000,000 - personal injury and advertising;

\$1,000,000 - each occurrence;

\$1,000,000 - auto liability including hired and non-owned;

\$2,000,000 - umbrella.

11.2 OWNER'S LIABILITY INSURANCE

11.2.1 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance. Optionally, the Owner may purchase and maintain other insurance for self-protection against claims which may arise from operations under the Contract. The Contractor shall not be responsible for purchasing and maintaining this optional Owner's liability insurance unless specifically required by the Contract Documents.

11.3 PROPERTY INSURANCE BUILDERS RISK POLICY

- 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance in the amount of the initial Contract Sum as well as subsequent modifications thereto for the entire Work at the site on a replacement cost basis. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Paragraph 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Paragraph 11.3 to be covered, whichever is earlier. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Work.
- 11.3.1.1 Property insurance shall be on an all-risk policy form and shall insure against the perils of fire and extended coverage and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, false-work, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's services and expenses required as a result of such insured loss. Coverage for other perils shall not be required unless otherwise provided in the Contract Documents. The form of policy for this coverage shall provide for coverage in the event of a loss up to the contemplated value of the property following completion of all Work required under the Contract.

- 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance which will protect the interests of the Contractor, Subcontractors and Subsubcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor, then the Owner shall bear all reasonable costs properly attributable thereto.
- 11.3.1.3 The property insurance maintained hereunder by the Owner has a deductible of \$100,000 applicable to each/any claim thereunder. In the event of any property damage arising from any occurrence prior to the Architect's issuance of a final Certificate for Payment under Section 9.10.1, including but not limited to property damage arising from vandalism or casualty of any kind, the Contractor shall be responsible for the cost of said property damage: (a) to the extent not indemnified by the Owner's insurance policy because of said deductible; or (b) to the extent not indemnified by the Owner's insurance policy for any other reason.
- 11.3.1.4 Property insurance for portions of the Work stored off site and in transit shall be procured and the cost borne by the Contractor, unless otherwise provided in the Contract Documents.
- 11.3.2 Boiler and Machinery Insurance. The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Subsubcontractors in the Work, and the Owner and Contractor shall be named insureds.
- 11.3.3 Loss of Use Insurance. The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused, to the extent covered and paid by insurance under this Subparagraph 11.3.3.
- 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or for other special hazards be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be borne by the Contractor.
- 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, adjoining or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Subparagraph 11.3.7 for damages caused by fire or other perils covered by this separate property

insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

- 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Paragraph 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Contractor.
- 11.3.7 Waivers of Subrogation. INTENTIONALLY OMITTED.
- 11.3.8 A loss insured under Owner's property insurance shall be adjusted by the Owner and made payable to the Owner on its behalf and on behalf of the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Subparagraph 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Subcontractors in similar manner.
- 11.3.9 If required in writing by a party in interest, the Owner shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties all subject to the requirements, if any, of the Owner's construction and/or permanent lender. The cost of required bonds shall be charged against proceeds received by Owner. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or in accordance with an arbitration award in which case the procedure shall be as provided in Paragraph 4.5.
- 11.3.10 The Owner shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection be made, arbitrators shall be chosen as provided in Paragraph 4.5. The Owner shall, in that case, make settlement with insurers in accordance with directions of such arbitrators. If distribution of insurance proceeds by arbitration is required, the arbitrators will direct such distribution.

11.4 PERFORMANCE BOND AND PAYMENT BOND

- 11.4.1 The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract. Said bonds shall satisfy the applicable statutory requirements of the place in which the Work is to be performed.
- 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall permit a copy to be made.

ARTICLE 12

UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING OF WORK

- 12.1.1 If a portion of the Work is covered, contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Architect, be uncovered for the Architect's observation and be replaced at the Contractor's expense without change in the Contract Time.
- 12.1.2 If a portion of the Work has been covered in accordance with the requirements specifically expressed in the contract documents, and which the Architect has not specifically requested to observe prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work is not in accordance with the Contract Documents, the Contractor shall pay such costs unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

12.2 CORRECTION OF WORK

- 12.2.1 The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear costs of correcting such rejected work, including additional testing and inspections and compensation for the Architect's services and expenses made necessary thereby and any cost, loss, or damages to the Owner resulting from such failure or defect.
- 12.2.2 If, within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Subparagraph 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. This period of one year shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work. This obligation under this Subparagraph 12.2.2 shall survive acceptance of the Work under the Contract and termination of the Contract. The Owner shall give such notice promptly after discovery of the condition.
- 12.2.3 The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

- 12.2.4 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Paragraph 2.4. If the Contractor does not proceed with correction of such nonconforming Work within a reasonable time fixed by written notice from the Architect, the Owner may remove it and store the salvable materials or equipment at the Contractor's expense. If the Contractor does not pay costs of such removal and storage within ten days after written notice, the Owner may upon ten additional days' written notice sell such materials and equipment at auction or at private sale and shall account for the proceeds thereof, after deducting costs and damages that should have been borne by the Contractor, including compensation for the Architect's services and expenses made necessary thereby. If such proceeds of sale do not cover costs which the Contractor should have borne, the Contract Sum shall be reduced by the deficiency. If payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.
- 12.2.5 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.
- 12.2.6 Nothing contained in this Paragraph 12.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the time period of one year as described in Subparagraph 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

12.3 ACCEPTANCE OF NONCONFORMING WORK

12.3.1 If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13

MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

13.1.1 The Contract shall be governed by the law of the place where the Project is located.

13.2 SUCCESSORS AND ASSIGNS

- 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements and obligations contained in the Contract Documents. Except as hereinafter provided, neither party to the Contract shall assign the Contract or sublet it as a whole without the written consent of the other, nor shall the Contractor assign any moneys due or to become due to him hereunder, without the previous written consent of the Owner. The Owner may assign the Contract to any institutional lender providing construction or permanent financing for the Project or to any person acquiring the Owner's interest in the Project, and the Contractor agrees to execute all consents, certificates, and other documents required by such lender or other person in connection with such assignment.
- 13.2.2 If the Owner conveys its interest in the Project to a third party, any rights which the Owner may have against the Contractor arising from this Agreement shall automatically transfer to such third party.

13.3 WRITTEN NOTICE

13.3.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or a member of the firm or entity or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified mail to the last business address known to the party giving notice.

13.4 RIGHTS AND REMEDIES

- 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.
- 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

13.5 TESTS AND INSPECTIONS

13.5.1 Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so the Architect may

observe such procedures. The Owner shall bear costs of tests, inspections or approvals which do not become requirements until after bids are received or negotiations concluded.

- 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Subparagraph 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so the Architect may observe such procedures. The Owner shall bear such costs except as provided in Subparagraph 13.5.3.
- 13.5.3 If such procedures for testing, inspection or approval under Subparagraphs 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, the Contractor shall bear all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses.
- The Contractor shall obtain and deliver promptly to the Architect any occupancy permit and any certificates of final inspection of any part of the Contractor's work and operating permits for any mechanical apparatus, such as elevators, escalators, boilers, air compressors, etc., which may be required by law to permit full use and occupancy of the premises by the Owner. Receipt of such permits or certificates by the Architect shall be a condition precedent to Substantial Completion of the Work.
- 13.5.5 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

13.6 LIMITATION OF LIABILITY

- 13.6.1 The Owner shall be liable only to the extent of its interest in the Project; and no officer, director, partner, agent or employee of the Owner (or any partner of a partner or any agent or employee of a partner) shall ever be personally or individually liable with respect to this Contract or the Work. Each Subcontract shall include the foregoing limitation, which shall be effective if the Owner ever succeeds to the Contractor's rights and obligations under a Subcontract.
- 13.7 The Contractor shall comply with any decisions of the Arlington Redevelopment Board applicable to the Project, and with any other Laws, By-Laws, Rules, and Regulations or Ordinances within the Town of Arlington.

ARTICLE 14

TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

- 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor, for any of the following reasons:
 - .1 issuance of an order of a court or other public authority having jurisdiction; or
 - .2 an act of government, such as declaration of national emergency, making material unavailable.
- 14.1.2 If one of the above reasons exists, the Contractor may, upon seven additional days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead, profit and damages.
- 14.1.3 If the Work is stopped for a period of 60 days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has persistently failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Subparagraph 14.1.2.

14.2 TERMINATION BY THE OWNER

14.2.1 If the Contractor is adjudged a bankrupt, or if the Contractor makes a general assignment for the benefit of the Contractor's creditors, or if a receiver is appointed on account of the Contractor's insolvency, or if the Contractor persistently or repeatedly refuses or fails, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or if the Contractor fails to make prompt payment to Subcontractors for materials or labor, or persistently disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, or otherwise is guilty of a significant violation of any provision of the Contract, including the failure to perform the Work in Accordance With the Contract, then the Contractor shall be in default, and the Owner may, without prejudice to any other right or remedy, and upon seven days' written notice to the Contractor, take possession of all materials, tools, appliances, equipment, construction equipment and machinery and vehicles, offices and other facilities on the Project site, and all

materials intended for the Work, wherever stored, and may terminate the employment of the Contractor, accept assignment of any or all Subcontracts pursuant to Paragraph 5.4, and finish the Work by whatever method the Owner may deem expedient. The Owner shall be entitled to collect from the Contractor all direct, indirect, liquidated, and consequential damages suffered by the Owner on account of the Contractor's default, including without limitation additional services and expenses of the Architect made necessary thereby. The Owner shall be entitled to hold all amounts due the Contractor at the date of termination until all of the Owner's damages have been established, and to apply such amounts to such damages.

- 14.2.2 When the Owner terminates the Contract for one of the reasons stated in Subparagraph 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished. Any payment to the Contractor in quantum meruit shall be capped at the amount due under this Contract, including any adjustments, regardless of whether said termination by the Owner is deemed rightful or wrongful.
- 14.2.3 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Architect, upon application, and this obligation for payment shall survive termination of the Contract.

215453.1

SUPPLEMENTAL STATUTORY CONDITIONS

ARTICLE 1 - WAGES AND EMPLOYMENT PRACTICES

- 1.1 Preference To Veterans and Citizens In Public Work; Rate of Wages. (Statutory reference: Mass. Gen. Laws Chapter 149, Section 26) This Paragraph applies to every contract or subcontract for the construction of public works by the Commonwealth or by a county, town or district, or by persons contracting or subcontracting for such works.
- 1.1.1 In the employment of mechanics and apprentices, teamsters, chauffeurs and laborers, preference shall first be given to citizens of the Commonwealth who have been residents of the Commonwealth for at least six months at the commencement of their employment, who are veterans as defined in Mass. Gen. Laws Chapter 4, Section 7, clause 43, and who are qualified to perform the work to which the employment relates; and secondly, to citizens of the Commonwealth generally who have been residents of the Commonwealth for at least six months at the commencement of their employment, and if they cannot be obtained in sufficient numbers, then to citizens of the United States, and every contract for such work shall contain a provision to this effect. Each county, town or district in the construction of public works, or persons contracting or subcontracting for such works, shall give preference to veterans and citizens who are residents of such county, town or district.
- 1.1.2 The rate per hour of the wages paid to said mechanics and apprentices, teamsters, chauffeurs and laborers in the construction of public works shall not be less than the rate or rates of wages to be determined by the Commissioner of Labor and Industries as hereinafter provided; provided, that the wages paid to laborers employed on said works shall not be less than those paid to laborers in the municipal service of the town or towns where said works are being constructed; provided, further, that where the same public work is to be constructed in two or more towns, the wages paid to laborers shall not be less than those paid to laborers in the municipal service of the town paying the highest rate; provided further, that if, in any of the towns where the works are to be constructed, a wage rate or wage rates have been established in certain trades and occupations by collective agreements or understandings in the private construction industry between organized labor and employers, the rate or rates to be paid on said works shall not be less than the rates so established; provided, further, that in towns where no such rate or rates have been so established, the wages paid to mechanics and apprentices, teamsters, chauffeurs and laborers on public works, shall not be less than the wages paid to the employees in the same trades and occupations by private employers engaged in the construction industry. This section shall also apply to regular employees of the Commonwealth or of a county, town or district, when such employees are employed in the construction, addition to or alteration of public buildings for which special appropriations of more than one thousand

dollars are provided. Payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans under collective bargaining agreements or understandings between organized labor and employers shall be included for the purpose of establishing minimum wage rates as herein provided.

1.2 List of Jobs; Classifications; Determination of Rate of Wages; Schedule.

(Statutory reference; Mass. Gen. Laws Chapter 149, Section 27) This Paragraph applies to every contract or subcontract for the construction of public works by the Commonwealth, or by a county, town or district.

The Commissioner of Labor and Industries shall prepare, for the use of such public officials or public bodies whose duty it shall be to cause public works to be constructed, a list of the several jobs usually performed on various types of public works upon which mechanics and apprentices, teamsters, chauffeurs and laborers are employed. The Commissioner shall classify said jobs, and he may revise such classifications from time to time, as he may deem advisable. Prior to awarding a contract for the construction of public works, said public official or public body shall submit to the Commissioner a list of the jobs upon which mechanics and apprentices, teamsters, chauffeurs and laborers are to be employed, and shall request the Commissioner to determine the rate of wages to be paid on each job. Said rates shall apply to all persons engaged in transporting gravel or fill to the site of said public works or removing gravel or fill from such site, regardless of whether such persons are employed by a contractor or subcontractor or are independent contractors or owner-operators. The Commissioner, subject to the provisions of Paragraph 1.1 of these Supplementary Statutory Conditions, shall proceed forthwith to determine the same, and shall furnish said official or public body with a schedule of such rate or rates of wages as soon as said determination shall have been made. In advertising or calling for bids for said works, the awarding official or public body shall incorporate said schedule in the advertisement or call for bids by an appropriate reference thereto, and shall furnish a copy of said schedule without cost, to any person requesting the same. Said schedule shall be made a part of the contract for said works and shall continue to the minimum rate or rates of wages for said employees during the life of the contract. Any person engaged in the construction of said works shall cause a legible copy of said schedule to be kept posted in a conspicuous place at the site of said works during the life of the contract. The aforesaid rates of wages in the schedule of wage rates shall include payment by employers to health and welfare plans, pension plans, and supplementary unemployment benefit plans and such payments shall be considered as payments to persons under this section performing work as herein provided. Any employer engaged in the construction of such works who does not make payments to a health and welfare plan, a pension plan and a supplementary unemployment benefit plan, where such payments are included in said rates of wages, shall pay the amount of said payments directly to each employee engaged in said construction. Note: The awarding authority does not guarantee the accuracy of any schedule of wage rates

furnished to the Contractor hereunder, and the Contractor shall be responsible for ascertaining the prevailing wages in the area where the work will be performed.

Employment Records To Be Kept By Contractor, Subcontractor; Statement of Compliance. (Statutory reference; Mass. Gen. Laws Chapter 149, Section 27B) This Paragraph applies to every contract or subcontract for the construction of public works by the Commonwealth, or by a county, town or district.

Every Contractor, Subcontractor or public body engaged in said public works to which Paragraph 1.2 of these Supplementary Statutory Conditions applies shall keep a true and accurate record of all mechanics and apprentices, teamsters, chauffeurs and laborers employed thereon, showing the name, address and occupational classification of each such employee on said works, and the hours worked by, and the wages paid to, each such employee, and shall furnish to the Commissioner of Labor and Industries, upon his request, a copy of said record, signed by the employer or his authorized agent under the penalties of perjury. Such records shall be open to inspection by any authorized representative of the Department of Labor and Industries at any reasonable time, and as often as may be necessary.

Each such Contractor, Subcontractor or public body shall preserve its payroll records for a period of three years from the date of completion of the contract.

Each such Contractor, Subcontractor or public body shall furnish to the Commissioner of Labor and Industries within fifteen days after completion of its portion of the work a statement, executed by the Contractor, Subcontractor, or public body or by any authorized officer or employee of the Contractor, Subcontractor or public body who supervises the payment of wages in the following form:

STATEMENT OF	COMPLIANCE		, 2004
I,			
(Name of sig	gnatory party)	(Title)	do hereby state:
public body) and apprentices, tea accordance with wa	on the msters, chauffeurs and le	and that all raborers employed on see provisions of section	Contractor, Subcontractor or nechanics (building or project) aid project have been paid in s twenty-six and twenty-seven
Signature			
Title			

The above mentioned copies of payroll records and statements of compliance shall be available for inspection by any interested party filing a written request to the Commissioner for such inspection.

1.4 Wages Paid to Operators of Trucks and Other Equipment. (Statutory reference: Mass. Gen. Laws Chapter 149, Section 27F) This Paragraph applies to every contract for the construction of public works by the Commonwealth, or by a county, city, town or district.

Prescribed rates of wages, as determined by the Commissioner of Labor and Industries, shall be paid to the operators of all trucks, vehicles or equipment employed on the Project. Said rates of wages shall be requested of said Commissioner by the awarding authority and shall be furnished by the Commissioner in a schedule containing the classification of jobs, and the rate of wages to be paid for each job. Said rates of wages shall include payments to health and welfare plans, or, if no such plan is in effect between employer and employees, the amount of such payments shall be paid directly to said operators.

1.5 Reserve Police Officers (Statutory reference: Mass. Gen. Laws. Chapter 149, Section 27B) This Paragraph 1.5 applies to every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public works for the Commonwealth or any political subdivision thereof.

The Contractor shall pay to any reserve police officer employed by him in any city or town the prevailing rate of wage paid to regular police officers in such city or town.

1.6 Eight-Hour Day, etc. This Paragraph 1.6 applies only to contracts which are subject to the provisions of Mass. Gen. Laws Chapter 149, Sections 30 and 34.

No laborer, worker, mechanic, foreman or inspector working within this Commonwealth in the employ of the Contractor, Subcontractor or other person doing or contracting to do the whole or part of the work contemplated by the contract, shall be required or permitted to work more than eight hours in any one day or more than forty-eight hours in any one week, or more than six days in any one week, except in cases of emergency.

1.7 Lodging, etc. (Statutory reference: Mass. Gen. Laws Chapter 149, Section 25) This Paragraph applies to every contract with the Commonwealth, a county, city or town, or with a department, board, commission, or officer acting therefor, for the doing of public work.

Every employee under this contract shall lodge, board and trade where and with whom he elects, and neither the Contractor nor his agents or employees shall, either directly or indirectly, require as a condition of the employment of any

person that the employee shall lodge, board or trade at a particular place or with a particular person.

1.8 Access to Contractor's Records (Executive Order No. 195) This paragraph applies to every contract for the purchase of services or material by any agency, bureau, board, commission, institution, or department of the Commonwealth.

The Governor or his designee, the secretary of administration and finance, and the state auditor or his designee shall have the right at reasonable times and upon reasonable notice to examine the books, records, and other compilations of data of the Contractor which pertain to the performance and requirements of this contract.

1.9 Worker's Compensation Insurance (Statutory reference: Mass. Gen. Laws Chapter 149, Section 34A) This Paragraph 1.9 applies to every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or other public works for the Commonwealth or any political subdivision thereof.

The Contractor shall, before commencing performance of the contract, provide by insurance for the payment of compensation and the furnishing of other benefits under Mass. Gen. Laws Chapter 152 to all persons to be employed under the contract, and the Contractor shall continue such insurance in full force and effect during the term of the contract. Sufficient proof of compliance with this Paragraph 1.9 must be furnished at the time of execution of this contract. Failure to provide and continue in force such insurance as aforesaid shall be deemed a material breach of the contract and shall operate as an immediate termination thereof. No cancellation of such insurance, whether by the insurer or by the insured, shall be valid unless written notice thereof is given by the party proposing cancellation to the other party and to the awarding authority at least fifteen days prior to the intended effective date thereof, which date shall be expressed in full notice.

ARTICLE 2 - EQUAL EMPLOYMENT OPPORTUNITY AND AFFIRMATIVE ACTION

(Statutory reference: Mass. Gen. Laws Chapter 151B; Executive Orders No. 74, No. 116 and No. 246). The provisions of this Article 2 are intended to comply with the Commonwealth's Supplemental Equal Employment Opportunity Anti-Discrimination and Affirmative Action Program, referred to in Executive Order No. 116 and administered by the Massachusetts Commission Against Discrimination. If no specific percentage has been inserted in Subparagraph 2.2.3 below, the applicable minimum percentage provided for in such Supplemental Program shall be deemed to have been so inserted.

2.1 <u>Definitions.</u> For purposes of this Contract, "minority" refers to Asian-Americans, Blacks, Spanish-Surnamed Americans, North American Indians, and Cape Verdeans. "Commission" refers to the Massachusetts Commission Against Discrimination.

- 2.2 <u>Non-Discrimination and Affirmative Action Requirements</u>. During the performance of this Contract, the Contractor and all of his Subcontractors (hereinafter "Contractor"), for himself, his assignees and successors in interest, agree to comply with Subparagraphs 2.2.1 through 2.2.11.
- 2.2.1 In connection with the performance of Work under this Contract, the Contractor shall not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, age or sex. The aforesaid provision shall include, but not be limited to, the following: employment upgrading, demotion, or transfer; recruitment advertising; recruitment layoff; termination; rates of pay or other forms of compensation; conditions or privileges of employment; and selection for apprenticeship. The Contractor shall post hereafter in conspicuous places, available for employees and applicants for employment, notices to be provided by the Commission setting forth the provisions of the Fair Employment Practices Law of the Commonwealth.
- In connection with the performance of Work under this Contract, the Contractor shall undertake in good faith affirmative action measures designed to eliminate any discriminatory barriers in the terms and conditions of employment on the grounds of race, color, religious creed, national origin, age or sex, and to eliminate and remedy any effects of such discrimination in the past. Such affirmative action shall entail positive and aggressive measures to ensure equal opportunity in the areas of hiring, upgrading, demotion or transfer, recruitment, layoff or termination, rate of compensation, and in-service or apprenticeship training programs. This affirmative action shall include all action required to guarantee equal employment opportunity for all persons, regardless of race, color, religious creed, national origin, age or sex. A purpose of this provision is to ensure to the fullest extent possible an adequate supply of skilled tradesmen for this and future Commonwealth public construction projects.
- 2.2.3 As part of his obligation of remedial action under the foregoing Subparagraph 2.2.2, the Contractor shall maintain on this project a not less than ten percent (10%) ratio of minority employee man hours to total man hours in each job category including but not limited to bricklayers, carpenters, cement masons, electricians, ironworkers, operating engineers, and those "classes of work" enumerated in Mass. Gen. Laws Chapter 149, Section 44F.
- 2.2.4 In the hiring of minority journeymen, apprentices, trainees and advanced trainees, the Contractor shall rely on referrals from a multi-employer affirmative action program approved by the Commission, traditional referral methods utilized by the construction industry, and referrals from agencies, not more than three in number at any one time, designated by the Liaison Committee (described in Subparagraph 2.2.5 below) or the Commission.

- 2.2.5 At the discretion of the Commission there may be established for the life of this Contract a body to be known as the Liaison Committee. The Liaison Committee shall be composed of one representative each from the agency or agencies administering this project, hereinafter called the administering agency, the Commission and such other representatives as may be designated by the Commission in conjunction with the administering agency.
- 2.2.6 The Contractor (or his agent, if any, designated by him as the on-site equal employment opportunity officer) shall recognize the Liaison Committee as an affirmative action body, and shall establish a continuing working relationship with the Liaison Committee, consulting with the Liaison Committee on all matters related to minority recruitment, referral, employment and training.
- 2.2.7 The Contractor shall prepare projected manning tables on a quarterly basis. These shall be broken down into projections, by week, of workers required in each trade. Copies shall be furnished one week in advance of the commencement of the period covered, and also when updated, to the Commission and Liaison Committee.
- 2.2.8 Records of employment referral orders, prepared by the Contractor, shall be made available to the Commission and to the Liaison Committee on request.
- 2.2.9 The Contractor shall prepare weekly reports in a form approved by the Commission of hours worked in each trade by each employee, identified as a minority or non-minority. Copies of these shall be provided at the end of each week to the Commission and to the Liaison Committee.

If the Contractor shall use any Subcontractor on any work performed under this Contract, he shall take affirmative action to negotiate with qualified minority Subcontractors. This affirmative action shall cover both pre-bid and post-bid periods. It shall include notification to the Office of Minority Business Assistance (within the Executive Office of Communities and Development) or its designee, while bids are in preparation, of all products, work or services for which the Contractor intends to negotiate bids.

In the employment of journeymen, apprentices, trainees and advanced trainees, the Contractor shall give preference, first, to citizens of the Commonwealth who have served in the armed forces of the United States in time of war and have been honorably discharged therefrom or released from active duty therein, and who are qualified to the perform the work to which the employment relates, and, secondly, to citizens of the Commonwealth generally, and, if such cannot be obtained in sufficient numbers, then to citizens of the United States.

A designee of the Commission and a designee of the Liaison Committee shall each have right of access to the construction site.

2.2.10 The Contractor shall maintain as a goal on this project a not less than five percent ratio of women work force to total project hours in both the general contract and each individual filed sub-bid contract.

A Labor Scheduling Table will be used as a tool for achieving a range of women work force participation for the entire project in both the general contract and each individual filed sub-bid contract. Said Labor Scheduling Table shall be in a form acceptable to the Town.

2.2.11 Before starting work, the Contractors (includes the General Contractor, for itself and its Subcontractors, as well as all filed sub-bid Contractors) will submit plans for achievement of the equal opportunity goals of the contract. All Contractors will be required to make a good faith effort to achieve these goals. The plan will indicate if the Contractors expect to achieve the requirements during the first quarter. If there are reasons why the Contractors do not expect to achieve the requirements during the first quarter year of the contract construction phase, then the Contractors shall provide a plan calculated to address, to the extent reasonably possible, these obstacles to a good faith effort to achieve such goals.

Not more than ten days following the end of each work quarter, the Contractors will report on the achievement of the goals, detailing the good faith efforts that have been made and will continue to be made and any other appropriate efforts not yet undertaken.

All reports will be signed by an officer or principal of the company who has the authority to contractually obligate the company.

- 2.3 The Contractor shall comply with the provisions of Executive Order No. 74, as amended by Executive Order No. 166, dated May 1, 1975, and of Mass. Gen. Laws Chapter 151B, both of which are herein incorporated by reference and made a part of this Contract.
- 2.4 The Contractor, in the performance of all Work, and prior to completion of the Work, will not discriminate on grounds of race, color, religious creed, national origin, age or sex in employment practices, in the selection or retention of Subcontractors, or in the procurement of materials and rentals of equipment.
- 2.5 In all solicitations either by competitive bidding or negotiation made by the Contractor either for work to be performed under a subcontract or for the procurement of materials or equipment, each potential Subcontractor or supplier shall be notified in writing by the Contractor of the Contractor's obligations under this Contract relative to non-discrimination and affirmative action.
- 2.6 The Contractor hereby certifies that he shall comply with the minority manpower ratio and specific action steps contained herein. The Contractor shall be required to obtain from each of its Subcontractors and submit to the administering agency

prior to the performance of any work under the Contract a certification by said Subcontractor, regardless of tier, that it will comply with the minority manpower ration and specific affirmative action steps contained herein. Such certification shall be provided on forms furnished by the administering agency or, in the absence thereof, on forms prescribed by the Commission.

- 2.7 The Contractor's certification form must be signed by all successful low bidder(s) prior to award by the administering agency.
- 2.8 Compliance Information, Reports and Sanctions.
- 2.8.1 The Contractor will provide all information and reports required by the administering agency or the Commission on instructions issued by either of them and will permit access to its facilities and books, records, accounts and other sources of information which may be determined by the Commission to affect the employment of personnel. This provision shall apply only to information pertinent to the Commonwealth's supplementary affirmative action contract requirements. Where information required is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the administering agency or the Commission as appropriate and shall set forth what efforts he has made to obtain the information.
- 2.8.2 Whenever the administering agency, the Commission or the Liaison Committee believes the Contractor or any Subcontractor may not be operating in compliance with the terms of this Paragraph 2.8, the Commission directly, or through its designated agent, shall conduct an appropriate investigation, and may confer with the parties, to determine if such Contractor is operating in compliance with the terms of this Paragraph 2.8. If the Commission or its agent finds the Contractor or any Subcontractor not in compliance, it shall make a preliminary report on noncompliance, and notify such Contractor in writing of such steps as will in the judgment of the Commission or its agent bring such Contractor into compliance. In the event that such Contractor fails or refuses to fully perform such steps, the Commission shall make a final report of non-compliance, and recommend to the administering agency the imposition of one or more of the sanctions listed below. If, however, the Commission believes the Contractor or any Subcontractor has taken or is taking every possible measure to achieve compliance, it shall not make a final report of non-compliance. Within fourteen days of the receipt of the recommendations of the Commission, the administering agency shall move to impose one or more of the following sanctions, as it may deem appropriate to attain full and effective enforcement:
 - (i) The recovery by the administering agency from the Contractor of 1/100 of 1% of the contract award price or \$1,000, whichever sum is greater, in the nature of liquidated damages or, if a Subcontractor is in non-compliance, the recovery by the administering agency from the Contractor, to be assessed by the Contractor as a back charge against

the Subcontractor, of 1/10 or 1% of the subcontract price, or \$400, whichever sum is greater, in the nature of liquidated damages, for each week that such party fails or refuses to comply;

- (ii) The suspension of any payment or part thereof due under the Contract until such time as the Contractor or any Subcontractor is able to demonstrate his compliance with the terms of the contract;
- (iii) The termination, or cancellation, of the Contract, in whole or in part, unless the Contractor or any subcontractor is able to demonstrate within a specified time his compliance with the terms of the Contract;
- (iv) The denial to the Contractor or any Subcontractor of the right to participate in any future contracts awarded by the administering agency for a period of up to three years.

If at any time after the imposition of one or more of the above sanctions a Contractor is able to demonstrate that he is in compliance with this Paragraph 2.8, he may request that the administering agency, in consultation with the Commission, suspend the sanctions conditionally, pending a final determination by the Commission as to whether the Contractor is in compliance. Upon final determination of the Commission, the administering agency, based on the recommendation of the Commission, shall either lift the sanctions or reimpose them.

Sanctions enumerated under Subparagraph 2.8.2 of this Paragraph 2.8 shall not be imposed by the administering agency except after an adjudicatory proceeding, as that term is used in Mass. Gen. Laws Chapter 30A, has been conducted. No investigation by the Commission or its agent shall be initiated without prior notice to the Contractor.

- 2.9 Severability. The provisions of this Article 2 are severable, and if any of these provisions shall be held unconstitutional by any court of competent jurisdiction, the decision of such court shall not affect or impair any of the remaining provisions.
- 2.10 The Contractor shall comply with the provisions of Executive Order No. 246, relating to discrimination against and equal employment opportunity for the handicapped, which is herein incorporated by reference and made a part of this Contract. In connection with the performance of work under this Contract, the Contractor, Subcontractors and suppliers of goods and services shall not discriminate against the handicapped. Furthermore, Contractors, Subcontractors and suppliers of goods and services must give written notice of their commitments under this Paragraph 2.10 to any labor union, association or brotherhood with which they have a collective bargaining contract or other agreement, and must give such notice to handicapped contractors and to handicapped contractor

associations. A copy of such notice must be furnished to the awarding authority at the time of the signing of the contract.

- 2.11 Suspension of Payments.
- 2.11.1 If the awarding authority determines after investigation that the Contractor or any Subcontractor is not in compliance with the terms of Article 2, it may suspend any payment or portion thereof due under the Contract until the Contractor demonstrates compliance with the terms of Article 2.
- 2.11.2 Payment shall not be suspended if the awarding authority finds that the Contractor made his best efforts to comply with Article 2, or that some other justifiable reason exists for waiving the provisions of Article 2 in whole or in part.
- 2.11.3 Payment may be suspended only after the Contractor and any other interested party shall have been given the opportunity to present evidence in support of its position at an informal hearing held by the awarding authority and the awarding authority has concluded upon review of all the evidence that such penalty is justified.
- 2.11.4 This temporary suspension of payments by the awarding authority is separate from the sanctions set forth in Paragraph 2.8 above, which are determined by the Commission and recommended to the awarding authority.

ARTICLE 3 - MASSACHUSETTS PUBLIC CONSTRUCTION STATUTES

3.1 To whatever extent Massachusetts statutory laws regarding public construction apply to this project, said laws specifically are incorporated herein as if re–stated herein.

ARTICLE 4 - TITLE I GENERAL GOVERNMENT, ARTICLE 16 CONSTRUCTION PROJECTS, § 1-3 OF THE TOWN OF ARLINGTON GENERAL BY-LAWS

- 4.1 Women Work Force Participation.
- 4.1.1 The contractor shall maintain as a goal on this project a not less than five percent ratio of women work force to total project hours in both the general contract and each individual filed sub-bid contract, if applicable. The preceding sentence shall be included in all construction contracts whether entered into by the Town pursuant to the provisions of M.G.L. c. 149 or M.G.L. c. 30, § 39M et. seq. provided however, that if entered into under Chapter 30 same shall not be deemed to apply where the projected bid price as determined by the Director of Public Works is not likely to exceed \$200,000.

- 4.1.2 A Labor Scheduling Table which will be used as a tool for achieving a range of women work force participation for the entire project in both the general contract and each individual filed sub-bid contract.
- 4.2 Equal Opportunity Goal Compliance.
- 4.2.1 Before starting work, the contractors (includes the general contractor, for itself and its subcontractors, as well as all filed sub-bid contractors, if applicable) will submit plans for achievement of the equal opportunity goals of the contract. All contractors will be required to make a good faith effort to achieve these goals. The plan will indicate if the contractors expect to achieve the requirements during the first quarter. If there are reasons why the contractors do not expect to achieve the requirements during the first quarter year of the contract construction phase, then the contractors shall provide a plan calculated to address, to the extent reasonably possible, these obstacles to a good faith effort to achieve such goals.
- 4.2.2 Not more than ten days following the end of each work quarter, the contractors will report on the achievement of the goals, detailing the good faith efforts that have been made and will continue to be made and any other appropriate efforts not yet undertaken.
- 4.2.3 All reports will be signed by an officer or principal of the company who has the authority to contractually obligate the company.
- 4.3 Recruitment and Training
- 4.3.1 Any board, officer, committee, or other agency of the Town, which acts on behalf of the Town in making or supervising any contract, in any amount exceeding the sum of \$100,000 for the purchase of goods or services or for the construction, renovation, or repair of buildings or other improvement of real estate, may make arrangements with contractors and other interested agencies for special programs of recruitment and training in connection with the work to be performed on such contract, with the objective of promoting equal employment opportunity for members of minority groups protected by the fair employment laws of the Commonwealth and the United States. Any board, officer, committee or other Town agency may expend Town funds in carrying them out provided that appropriations specifically designed for such purposes have been voted by the Town Meeting.

215451.1

THE MASSACHUSETTS PREVAILING WAGE LAW

M.G.L. C. 149, §§26-27

NOTICE TO AWARDING AUTHORITIES

- A. The enclosed wage schedule applies only to the specific project listed at the top of the schedule, and these rates will remain in effect for the duration of the project, except in the case of multi-year projects. For projects lasting longer than one year, awarding authorities must request updated rates.
- B. You should request an updated wage schedule from the Department of Labor Standards if you have not opened bids or selected a contractor within 90 days of the date of issuance of the enclosed wage schedule.
- C. The wage schedule shall be incorporated in any advertisement or call for bids for the project for which it has been issued.
- D. Once a contractor has been selected by the awarding authority, the wage schedule shall be made a part of the contract for that project.

NOTICE TO CONTRACTORS

- E. The enclosed wage schedule must be posted in a conspicuous place at the work site during the life of the project.
- F. The wages listed on the enclosed wage schedule must be paid to employees on public works projects regardless of whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- G. The enclosed wage schedule applies to all phases of the project, including the final clean-up. Contractors whose only role is to perform final clean-up must pay their employees according to this wage schedule.
- H. All apprentices must be registered with the Massachusetts Division of Apprenticeship Standards (DAS) in order to be paid at the lower apprentice rates. All apprentices must keep his/her apprentice identification card on his/her person during all work hours. If a worker is not registered with DAS, they must be paid the "total rate" listed on the wage schedule regardless of experience or skill level. For further information, please call 617-626-5409, or write to:

DAS 19 Staniford Street, 1st Floor P.O. Box 146759, Boston, MA 02114.

WEEKLY PAYROLL RECORDS REPORT & STATEMENT OF COMPLIANCE

In accordance with Massachusetts General Law c. 149, §27B, a true and accurate record must be kept of all persons employed on the public works project for which the enclosed rates have been provided. A Payroll Form is available from the Department of Labor Standards (DLS) at www.mass.gov/dols/pw and includes all the information required to be kept by law. Every contractor or subcontractor is required to keep these records and preserve them for a period of three years from the date of completion of the contract.

On a weekly basis, every contractor and subcontractor is required to submit a certified copy of their weekly payroll records to the awarding authority; this includes the payroll forms and the Statement of Compliance form. The certified payroll records must be submitted either by regular mail or by e-mail to the awarding authority. Once collected, the awarding authority is required to preserve those records for three years from the date of completion of the project.

Each such contractor and subcontractor shall furnish weekly **and** within 15 days after completion of its portion of the work, to the awarding authority directly by first-class mail or e-mail, a statement, executed by the contractor, subcontractor or by any authorized officer thereof who supervised the payment of wages, this form, accompanied by their payroll:

STATEMEN	T OF COMPLIANCE
-	, 20
Ι,	,
(Name of signatory party)	(Title)
do hereby state:	
That I pay or supervise the pay	ment of the persons employed by
	on the
(Contractor, subcontractor or public body)	
said project have been paid in accordan	teamsters, chauffeurs and laborers employed on ace with wages determined under the provisions of
sections twenty-six and twenty-seven of General Laws.	f chapter one hundred and forty nine of the
Signa	ature
Title	

WEEKLY CERTIFIED PAYROLL REPORT AND WORKFORCE PARTICIPATION FORM

<u>CERTIFIED PAYROLL REPORT:</u> Pursuant to MGL c. 149, s. 27B, every contractor and subcontractor is required to submit a <u>true and accurate</u> copy of their certified weekly payroll records to the awarding authority by first-class mail or e-mail. In addition, each weekly payroll must be accompanied by a statement of compliance signed by the employer. Failure to comply may result in the commencement of a criminal action or the issuance of a civil citation.

WORKFORCE PARTICIPATION GOALS: The Commonwealth of Massachusetts has set the following goals for workforce participation for minorities and women. The participation goals for this project shall be 15.3% for minorities and 6.9% for women. The Contractor shall strive to achieve on this project the labor workforce participation goals contained herein. The Contractor shall enter the number of hours worked in each trade by each employee, identified as woman, minority, or non-minority below.

Company Name:					Address:								Phone	No.:			Payroll I	No.:			
Employer's Signature:					Title:								Contra	act No:	Tax Paye	r ID #:	Work W	eek Endi	ng:		
Awarding Authority Name:					Public Wo	orks Pr	oject Na	ame:					Public	Works Pro	ject Loca	tion:	Min. Wa	ge Rate \$	Sheet Nur	nber:	
General / Prime Contractor's I	Name:				Subcontra	actor's	Name:						,			Employe	r Hourly F	ringe Be	nefit Con	tributions	
																		(1	B+C+D+E)	(A x F)	
Employee Name &	Work	Project Hours	Project Hours	Project Hours			HA 10 Rate			Project Hours (A)	Hourly Base	Health & Welfare	ERISA Pension	Supp.	Total Hourly	Project Gross Wages	Check No.				
Complete Address	Classification		Minority W		certified (?)		Su.	Mo.	Tu.	We.	Th.	Fr.	Sa.	All Other Hours	Wage (B)	Insurance (C/)	Plan (D)	(E/)	Prev. Wage (F)	Total Gross Wages	(H)
															Ī						
															1						

APPRENTICESHIP DOCUMENTATION:

Please answer the questions below.

- (1) Are any apprentice employees identified above?
- (2) If yes, are all apprentice employees identified above currently registered with the MA DLS Division of Apprentice Standards?
- (3) If yes, is a copy of the apprentice ID card issued by the MA DLS Division of Apprentice Standards included for all apprentice employees identified above?

YES	NO	
YES	NO	
YES	NO	

PAGE	OF	



THE COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H

LAUREN JONES Secretary

MICHAEL FLANAGAN
Director

Lt. Governor

Awarding Authority: Town of Arlington

Contract Number: 23-33 City/Town: ARLINGTON

Description of Work: 23-33 Office Build-Out Bishop Elementary School, including demolition of existing office and conference room

and construction of three offices and conference room

Job Location: 25 Columbia Rd, Arlington, MA

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, the awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. The annual update requirement is not applicable to 27F "rental of equipment" contracts. The updated wage schedule must be provided to all contractors, including general and sub-contractors, working on the construction project.
- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or a sub-contractor.
- Apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Standards (DAS).
 Apprentices must keep their apprentice identification card on their persons during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. Any apprentice not registered with DAS regardless of whether they are registered with another federal, state, local, or private agency must be paid the journeyworker's rate.
- Every contractor or subcontractor working on the construction project must submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. For a sample payroll reporting form go to http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Contractors must obtain the wage schedules from awarding authorities. Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may file a complaint with the Fair Labor Division of the office of the Attorney General at (617) 727-3465.

Issue Date: 05/26/2023 **Wage Request Number:** 20230526-010

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	12/01/2021	\$37.05	\$13.41	\$16.01	\$0.00	\$66.47
(3 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	12/01/2021	\$37.12	\$13.41	\$16.01	\$0.00	\$66.54
(4 & 5 AXLE) DRIVER - EQUIPMENT TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	12/01/2021	\$37.24	\$13.41	\$16.01	\$0.00	\$66.66
ADS/SUBMERSIBLE PILOT PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2020	\$103.05	\$9.40	\$23.12	\$0.00	\$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR	12/01/2022	\$43.93	\$9.10	\$17.57	\$0.00	\$70.60
LABORERS - ZONE 1	06/01/2023	\$44.33	\$9.40	\$17.82	\$0.00	\$71.55
	12/01/2023	\$45.58	\$9.40	\$17.82	\$0.00	\$72.80
For apprentice rates see "Apprentice- LABORER"						
AIR TRACK OPERATOR (HEAVY & HIGHWAY)	12/01/2022	\$43.33	\$9.35	\$17.82	\$0.00	\$70.50
LABORERS - ZONE 1 (HEAVY & HIGHWAY)	06/01/2023	\$44.33	\$9.40	\$17.82	\$0.00	\$71.55
	12/01/2023	\$45.58	\$9.40	\$17.82	\$0.00	\$72.80
	06/01/2024	\$47.06	\$9.40	\$17.82	\$0.00	\$74.28
	12/01/2024	\$48.53	\$9.40	\$17.82	\$0.00	\$75.75
	06/01/2025	\$50.03	\$9.40	\$17.82	\$0.00	\$77.25
	12/01/2025	\$51.53	\$9.40	\$17.82	\$0.00	\$78.75
	06/01/2026	\$53.08	\$9.40	\$17.82	\$0.00	\$80.30
	12/01/2026	\$54.58	\$9.40	\$17.82	\$0.00	\$81.80
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. HEAT & FROST INSULATORS LOCAL 6 (BOSTON)	12/01/2020	\$38.10	\$12.80	\$9.45	\$0.00	\$60.35
ASPHALT RAKER	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
LABORERS - ZONE I	06/01/2023	\$43.83	\$9.40	\$17.82	\$0.00	\$71.05
	12/01/2023	\$45.08	\$9.40	\$17.82	\$0.00	\$72.30
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY)	12/01/2022	\$42.83	\$9.35	\$17.82	\$0.00	\$70.00
LABORERS - ZONE 1 (HEAVY & HIGHWAY)	06/01/2023	\$43.83	\$9.40	\$17.82	\$0.00	\$71.05
	12/01/2023	\$45.08	\$9.40	\$17.82	\$0.00	\$72.30
	06/01/2024	\$46.56	\$9.40	\$17.82	\$0.00	\$73.78
	12/01/2024	\$48.03	\$9.40	\$17.82	\$0.00	\$75.25
	06/01/2025	\$49.53	\$9.40	\$17.82	\$0.00	\$76.75
	12/01/2025	\$51.03	\$9.40	\$17.82	\$0.00	\$78.25
	06/01/2026	\$52.58	\$9.40	\$17.82	\$0.00	\$79.80
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	12/01/2026	\$54.08	\$9.40	\$17.82	\$0.00	\$81.30

Issue Date: 05/26/2023 **Wage Request Number:** 20230526-010 **Page 2 of 41**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE	12/01/2022	\$53.63	\$14.25	\$16.05	\$0.00	\$83.93
OPERATING ENGINEERS LOCAL 4	06/01/2023	\$54.88	\$14.25	\$16.05	\$0.00	\$85.18
	12/01/2023	\$56.13	\$14.25	\$16.05	\$0.00	\$86.43
	06/01/2024	\$57.43	\$14.25	\$16.05	\$0.00	\$87.73
	12/01/2024	\$58.88	\$14.25	\$16.05	\$0.00	\$89.18
	06/01/2025	\$60.18	\$14.25	\$16.05	\$0.00	\$90.48
	12/01/2025	\$61.63	\$14.25	\$16.05	\$0.00	\$91.93
	06/01/2026	\$62.93	\$14.25	\$16.05	\$0.00	\$93.23
	12/01/2026	\$64.38	\$14.25	\$16.05	\$0.00	\$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER OPERATING ENGINEERS LOCAL 4	12/01/2022	\$53.63	\$14.25	\$16.05	\$0.00	\$83.93
7. D	06/01/2023	\$54.88	\$14.25	\$16.05	\$0.00	\$85.18
	12/01/2023	\$56.13	\$14.25	\$16.05	\$0.00	\$86.43
	06/01/2024	\$57.43	\$14.25	\$16.05	\$0.00	\$87.73
	12/01/2024	\$58.88	\$14.25	\$16.05	\$0.00	\$89.18
	06/01/2025	\$60.18	\$14.25	\$16.05	\$0.00	\$90.48
	12/01/2025	\$61.63	\$14.25	\$16.05	\$0.00	\$91.93
	06/01/2026	\$62.93	\$14.25	\$16.05	\$0.00	\$93.23
For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2026	\$64.38	\$14.25	\$16.05	\$0.00	\$94.68
BARCO-TYPE JUMPING TAMPER	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
ABORERS - ZONE 1	06/01/2023	\$43.83	\$9.40	\$17.82	\$0.00	\$71.05
	12/01/2023	\$45.08	\$9.40	\$17.82	\$0.00	\$72.30
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER	12/01/2022	\$43.93	\$9.10	\$17.57	\$0.00	\$70.60
ABORERS - ZONE I	06/01/2023	\$44.33	\$9.40	\$17.82	\$0.00	\$71.55
For apprentice rates see "Apprentice- LABORER"	12/01/2023	\$45.58	\$9.40	\$17.82	\$0.00	\$72.80
SLOCK PAVER, RAMMER / CURB SETTER (HEAVY &	12/01/2022	\$43.33	\$9.35	\$17.82	\$0.00	\$70.50
IIGHWAY) ABORERS - ZONE 1 (HEAVY & HIGHWAY)	06/01/2023	\$44.33	\$9.40	\$17.82	\$0.00	\$71.55
ABONDAS - ZOVE I (ILZAVI & INGILWAI)	12/01/2023	\$45.58	\$9.40	\$17.82	\$0.00	\$72.80
	06/01/2024	\$47.06	\$9.40	\$17.82	\$0.00	\$74.28
	12/01/2024	\$48.53	\$9.40	\$17.82	\$0.00	\$75.75
	06/01/2025	\$50.03	\$9.40	\$17.82	\$0.00	\$77.25
	12/01/2025	\$51.53	\$9.40	\$17.82	\$0.00	\$78.75
	06/01/2026	\$53.08	\$9.40	\$17.82	\$0.00	\$80.30
	12/01/2026	\$54.58	\$9.40	\$17.82	\$0.00	\$81.80
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
BOILER MAKER	01/01/2023	\$47.37	\$7.07	\$20.31	\$0.00	\$74.75
OILERMAKERS LOCAL 29	01/01/2024	\$48.12	\$7.07	\$20.60	\$0.00	\$75.79

 Issue Date:
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Total Rate

Apprentice - BOILERMAKER - Local 29

Pension

	Effecti	ve Date -	01/01/2023				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	65		\$30.79	\$7.07	\$13.22	\$0.00	\$51.08	
	2	65		\$30.79	\$7.07	\$13.22	\$0.00	\$51.08	
	3	70		\$33.16	\$7.07	\$14.23	\$0.00	\$54.46	
	4	75		\$35.53	\$7.07	\$15.24	\$0.00	\$57.84	
	5	80		\$37.90	\$7.07	\$16.25	\$0.00	\$61.22	
	6	85		\$40.26	\$7.07	\$17.28	\$0.00	\$64.61	
	7	90		\$42.63	\$7.07	\$18.28	\$0.00	\$67.98	
	8	95		\$45.00	\$7.07	\$19.32	\$0.00	\$71.39	
	Effecti	ve Date -	01/01/2024						
	Step	percent	01/01/2021	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
	1	65		\$31.28	\$7.07	\$13.22	\$0.00	\$51.57	
	2	65		\$31.28	\$7.07	\$13.22	\$0.00	\$51.57	
	3	70		\$33.68	\$7.07	\$14.23	\$0.00	\$54.98	
	4	75		\$36.09	\$7.07	\$15.24	\$0.00	\$58.40	
	5	80		\$38.50	\$7.07	\$16.25	\$0.00	\$61.82	
	6	85		\$40.90	\$7.07	\$17.28	\$0.00	\$65.25	
	7	90		\$43.31	\$7.07	\$18.28	\$0.00	\$68.66	
	8	95		\$45.71	\$7.07	\$19.32	\$0.00	\$72.10	
	Notes:								
	Appre	ntice to Jo	urneyworker Ratio:1:4	. — — — — -					
		ICIAL MA	SONRY (INCL. MASONRY	02/01/2023	\$60.35	\$11.49	\$22.34	\$0.00	\$94.18
WATERPROOF BRICKLAYERS LOC	-	OSTON)		08/01/2023	\$62.40	\$11.49	\$22.34	\$0.00	\$96.23
	,	,		02/01/2024	\$63.65	\$11.49	\$22.34	\$0.00	\$97.48
				08/01/2024	\$65.75	\$11.49	\$22.34	\$0.00	\$99.58
				02/01/2025	\$67.05	\$11.49	\$22.34	\$0.00	\$100.88
				08/01/2025	\$69.20	\$11.49	\$22.34	\$0.00	\$103.03
				02/01/2026	\$70.55	\$11.49	\$22.34	\$0.00	\$104.38
				08/01/2026	\$72.75	\$11.49	\$22.34	\$0.00	\$106.58
				02/01/2027	\$74.15	\$11.49	\$22.34	\$0.00	\$107.98

Step	percent		Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50		\$30.18	\$11.49	\$22.34	\$0.00	\$64.01
2	60		\$36.21	\$11.49	\$22.34	\$0.00	\$70.04
3	70		\$42.25	\$11.49	\$22.34	\$0.00	\$76.08
4	80		\$48.28	\$11.49	\$22.34	\$0.00	\$82.11
5	90		\$54.32	\$11.49	\$22.34	\$0.00	\$88.15
Effect	ive Date -	08/01/2023	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Effecti	ive Date -	08/01/2023				Supplemental	
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	50		\$31.20	\$11.49	\$22.34	\$0.00	\$65.03
2	60		\$37.44	\$11.49	\$22.34	\$0.00	\$71.27
3	70		\$43.68	\$11.49	\$22.34	\$0.00	\$77.51
4	80		\$49.92	\$11.49	\$22.34	\$0.00	\$83.75
5	90		\$56.16	\$11.49	\$22.34	\$0.00	\$89.99
Notes:							

Apprentice to Journeyworker Ratio:1:	tice to Journeyworker Ratio:1:	Apprentice	
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BULLDOZER/GRADER/SCRAPER	12/01/2022	\$53.05	\$14.25	\$16.05	\$0.00	\$83.35
OPERATING ENGINEERS LOCAL 4	06/01/2023	\$54.29	\$14.25	\$16.05	\$0.00	\$84.59
	12/01/2023	\$55.53	\$14.25	\$16.05	\$0.00	\$85.83
	06/01/2024	\$56.81	\$14.25	\$16.05	\$0.00	\$87.11
	12/01/2024	\$58.25	\$14.25	\$16.05	\$0.00	\$88.55
	06/01/2025	\$59.53	\$14.25	\$16.05	\$0.00	\$89.83
	12/01/2025	\$60.97	\$14.25	\$16.05	\$0.00	\$91.27
	06/01/2026	\$62.25	\$14.25	\$16.05	\$0.00	\$92.55
	12/01/2026	\$63.69	\$14.25	\$16.05	\$0.00	\$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN	12/01/2022	\$43.73	\$9.35	\$17.97	\$0.00	\$71.05
LABORERS - FOUNDATION AND MARINE	06/01/2023	\$44.73	\$9.40	\$17.97	\$0.00	\$72.10
	12/01/2023	\$45.98	\$9.40	\$17.97	\$0.00	\$73.35
	06/01/2024	\$47.46	\$9.40	\$17.97	\$0.00	\$74.83
	12/01/2024	\$48.93	\$9.40	\$17.97	\$0.00	\$76.30
	06/01/2025	\$50.43	\$9.40	\$17.97	\$0.00	\$77.80
	12/01/2025	\$51.93	\$9.40	\$17.97	\$0.00	\$79.30
	06/01/2026	\$53.48	\$9.40	\$17.97	\$0.00	\$80.85
	12/01/2026	\$54.98	\$9.40	\$17.97	\$0.00	\$82.35

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING LABORER	12/01/2022	\$42.58	\$9.35	\$17.97	\$0.00	\$69.90
LABORERS - FOUNDATION AND MARINE	06/01/2023	\$43.58	\$9.40	\$17.97	\$0.00	\$70.95
	12/01/2023	\$44.83	\$9.40	\$17.97	\$0.00	\$72.20
	06/01/2024	\$46.31	\$9.40	\$17.97	\$0.00	\$73.68
	12/01/2024	\$47.78	\$9.40	\$17.97	\$0.00	\$75.15
	06/01/2025	\$49.28	\$9.40	\$17.97	\$0.00	\$76.65
	12/01/2025	\$50.78	\$9.40	\$17.97	\$0.00	\$78.15
	06/01/2026	\$52.33	\$9.40	\$17.97	\$0.00	\$79.70
	12/01/2026	\$53.83	\$9.40	\$17.97	\$0.00	\$81.20
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN	12/01/2022	\$42.58	\$9.35	\$17.97	\$0.00	\$69.90
LABORERS - FOUNDATION AND MARINE	06/01/2023	\$43.58	\$9.40	\$17.97	\$0.00	\$70.95
	12/01/2023	\$44.83	\$9.40	\$17.97	\$0.00	\$72.20
	06/01/2024	\$46.31	\$9.40	\$17.97	\$0.00	\$73.68
	12/01/2024	\$47.78	\$9.40	\$17.97	\$0.00	\$75.15
	06/01/2025	\$49.28	\$9.40	\$17.97	\$0.00	\$76.65
	12/01/2025	\$50.78	\$9.40	\$17.97	\$0.00	\$78.15
	06/01/2026	\$52.33	\$9.40	\$17.97	\$0.00	\$79.70
	12/01/2026	\$53.83	\$9.40	\$17.97	\$0.00	\$81.20
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
LABORERS - ZONE I	06/01/2023	\$43.83	\$9.40	\$17.82	\$0.00	\$71.05
	12/01/2023	\$45.08	\$9.40	\$17.82	\$0.00	\$72.30
For apprentice rates see "Apprentice- LABORER"						
CARPENTER CARPENTERS - ZONE 2 (Eastern Massachusetts)	03/01/2023	\$45.12	\$9.33	\$19.97	\$0.00	\$74.42

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.56	\$9.33	\$1.73	\$0.00	\$33.62
2	60	\$27.07	\$9.33	\$1.73	\$0.00	\$38.13
3	70	\$31.58	\$9.33	\$14.78	\$0.00	\$55.69
4	75	\$33.84	\$9.33	\$14.78	\$0.00	\$57.95
5	80	\$36.10	\$9.33	\$16.51	\$0.00	\$61.94
6	80	\$36.10	\$9.33	\$16.51	\$0.00	\$61.94
7	90	\$40.61	\$9.33	\$18.24	\$0.00	\$68.18
8	90	\$40.61	\$9.33	\$18.24	\$0.00	\$68.18
Note	es:					
j		1/17; 45/45/55/55/70/70/80/80 \$36.93/ 5&6 \$56.82/ 7&8 \$63.06				İ
App	orentice to Journeyworker	Ratio:1:5				

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CARPENTERS-ZONE 3 (Wood Frame)

All Aspects of New Wood Frame Work

Pension

Total Rate

Apprentice -	CARPENTER (Wood Frame) - Zone 3
Effective Date	04/01/2023

Effe	ctive Date - 04/01/2023				Supplemental		
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment		
1	60	\$14.50	\$7.21	\$0.00	\$0.00	\$21.71	
2	60	\$14.50	\$7.21	\$0.00	\$0.00	\$21.71	
3	65	\$15.70	\$7.21	\$0.00	\$0.00	\$22.91	
4	70	\$16.91	\$7.21	\$0.00	\$0.00	\$24.12	
5	75	\$18.12	\$7.21	\$3.80	\$0.00	\$29.13	
6	80	\$19.33	\$7.21	\$3.80	\$0.00	\$30.34	
7	85	\$20.54	\$7.21	\$3.80	\$0.00	\$31.55	
8	90	\$21.74	\$7.21	\$3.80	\$0.00	\$32.75	
Note	s:						
		7; 45/45/55/55/70/70/80/80 0.22/ 5&6 \$27.57/ 7&8 \$29.94					
App	rentice to Journeyworker Ra	tio:1:5					
MENT MASONR		01/01/2023	\$49.45	\$12.75	\$22.74	\$0.87	\$85.81
CKLAYERS LOCAL 3 (1	BOSTON)	07/01/2023	\$50.59	\$12.75	\$22.74	\$0.87	\$86.95
		01/01/2024	\$51.73	\$12.75	\$22.74	\$0.87	\$88.09

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Total Rate

Apprentice - CEMENT MASONRY/PLASTERING - Eastern Mass (Boston)

Pension

	Effecti		1/01/2023	. C Editor in Mass (B	00.0,		Supplemental		
	Step	percent		pprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50		\$24.73	\$12.75	\$15.49	\$0.00	\$52.97	
	2	60		\$29.67	\$12.75	\$17.99	\$0.87	\$61.28	
	3	65		\$32.14	\$12.75	\$18.99	\$0.87	\$64.75	
	4	70		\$34.62	\$12.75	\$19.99	\$0.87	\$68.23	
	5	75		\$37.09	\$12.75	\$20.99	\$0.87	\$71.70	
	6	80		\$39.56	\$12.75	\$21.99	\$0.87	\$75.17	
	7	90		\$44.51	\$12.75	\$22.99	\$0.87	\$81.12	
			7/01/2023	. B. W	77 14	. ·	Supplemental	T . 1 D .	
	Step	percent	Aj	oprentice Base Wage		Pension	Unemployment	Total Rate	
	1	50		\$25.30	\$12.75	\$15.49	\$0.00	\$53.54	
	2	60		\$30.35	\$12.75	\$17.99	\$0.87	\$61.96	
	3	65		\$32.88	\$12.75	\$18.99	\$0.87	\$65.49	
	4	70		\$35.41	\$12.75	\$19.99	\$0.87	\$69.02	
	5	75		\$37.94	\$12.75	\$20.99	\$0.87	\$72.55	
	6	80		\$40.47	\$12.75	\$21.99	\$0.87	\$76.08	
	7	90		\$45.53	\$12.75	\$22.99	\$0.87	\$82.14	
	Notes:	Steps 3,4 are	500 hrs. All other steps are	1,000 hrs.					
	Appre	ntice to Journ	neyworker Ratio:1:3					'	
CHAIN SAW O		OR		12/01/2022	2 \$43.4	\$9.10	\$17.57	\$0.00	\$70.10
LABORERS - ZONE	I			06/01/2023	\$43.8	\$9.40	\$17.82	\$0.00	\$71.05
For apprentice i	rates see "	Apprentice- LAB	ORER"	12/01/2023	\$45.0	9.40	\$17.82	\$0.00	\$72.30
			S/HEADING MACHINES	12/01/2022	2 \$54.6	58 \$14.25	\$16.05	\$0.00	\$84.98
OPERATING ENGIN	VEERS LC	OCAL 4		06/01/2023	\$55.9	95 \$14.25	\$16.05	\$0.00	\$86.25
				12/01/2023	\$57.2	23 \$14.25	\$16.05	\$0.00	\$87.53
				06/01/2024	\$58.5	\$14.25	\$16.05	\$0.00	\$88.85
				12/01/2024	\$60.0	3 \$14.25	\$16.05	\$0.00	\$90.33
				06/01/2025	\$61.3	\$14.25	\$16.05	\$0.00	\$91.66
				12/01/2025	\$62.8	\$14.25	\$16.05	\$0.00	\$93.13
				06/01/2026	\$64.1	16 \$14.25	\$16.05	\$0.00	\$94.46
For apprentice i	rates see "	Apprentice- OPE	RATING ENGINEERS"	12/01/2026	\$65.6	54 \$14.25	\$16.05	\$0.00	\$95.94

Classification			Effective Da	te Base Wag	e Health		Supplemental Unemployment	Total Rate
COMPRESSO OPERATING ENC			12/01/2022	\$35.08	\$14.25	\$16.05	\$0.00	\$65.38
OPERATING ENC	INEEKS LO	CAL 4	06/01/2023	\$35.90	\$14.25	\$16.05	\$0.00	\$66.20
			12/01/2023	\$36.72	\$14.25	\$16.05	\$0.00	\$67.02
			06/01/2024	\$37.57	\$14.25	\$16.05	\$0.00	\$67.87
			12/01/2024	\$38.52	\$14.25	\$16.05	\$0.00	\$68.82
			06/01/2025	\$39.37	\$14.25	\$16.05	\$0.00	\$69.67
			12/01/2025	\$40.32	\$14.25	\$16.05	\$0.00	\$70.62
			06/01/2026	\$41.18	\$14.25	\$16.05	\$0.00	\$71.48
.		A CORED ATTIVO ENGINEERON	12/01/2026	\$42.13	\$14.25	\$16.05	\$0.00	\$72.43
		'Apprentice- OPERATING ENGINEERS"				***	40.00	
DELEADER (PAINTERS LOCAL			01/01/2023			\$23.05	\$0.00	\$87.76
			07/01/2023			\$23.05	\$0.00	\$88.96
			01/01/2024			\$23.05	\$0.00	\$90.16
			07/01/2024			\$23.05	\$0.00	\$91.36
			01/01/2025	\$60.86	\$8.65	\$23.05	\$0.00	\$92.56
		ntice - PAINTER Local 35 - BRIDG	ES/TANKS			Supplementa		
	Step	percent	Apprentice Base Wage	Health	Pension	Unemploymen		
	1	50	\$28.03	\$8.65	\$0.00	\$0.00	\$36.68	
	2	55	\$30.83	\$8.65	\$6.27	\$0.00	\$45.75	
	3	60	\$33.64	\$8.65	\$6.84	\$0.00	\$49.13	
	4	65	\$36.44	\$8.65	\$7.41	\$0.00	\$52.50	
	5	70	\$39.24	\$8.65	\$19.63	\$0.00	\$67.52	
	6	75	\$42.05	\$8.65	\$20.20	\$0.00	\$70.90	
	7	80	\$44.85	\$8.65	\$20.77	\$0.00	\$74.27	
	8	90	\$50.45	\$8.65	\$21.91	\$0.00	\$81.01	
	Effecti Step	ive Date - 07/01/2023	Apprentice Base Wage	Haalth	Pension	Supplemental Unemployment		
	1	percent						
	2	50	\$28.63	\$8.65	\$0.00	\$0.00		
	3	55	\$31.49	\$8.65	\$6.27	\$0.00		
		60	\$34.36	\$8.65	\$6.84	\$0.00		
	4 5	65	\$37.22	\$8.65	\$7.41	\$0.00		
		70	\$40.08	\$8.65	\$19.63	\$0.00		
	6 7	75	\$42.95	\$8.65	\$20.20	\$0.00		
	8	80 90	\$45.81 \$51.53	\$8.65 \$8.65	\$20.77 \$21.91	\$0.00 \$0.00		
	Notes:	Steps are 750 hrs.						
	Appre	ntice to Journeyworker Ratio:1:1						
DEMO: ADZI			12/01/2022	\$43.33	\$9.10	\$17.57	\$0.00	\$70.00
LABORERS - ZON	E I		06/01/2023	\$43.73	\$9.40	\$17.82	\$0.00	\$70.95
			12/01/2023	\$44.98	\$9.40	\$17.82	\$0.00	\$72.20

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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR	12/01/2022	\$44.33	\$9.10	\$17.57	\$0.00	\$71.00
LABORERS - ZONE 1	06/01/2023	\$44.73	\$9.40	\$17.82	\$0.00	\$71.95
	12/01/2023	\$45.98	\$9.40	\$17.82	\$0.00	\$73.20
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS LABORERS - ZONE 1	12/01/2022	\$44.08	\$9.10	\$17.57	\$0.00	\$70.75
	06/01/2023	\$44.48	\$9.40	\$17.82	\$0.00	\$71.70
For apprentice rates see "Apprentice- LABORER"	12/01/2023	\$45.73	\$9.40	\$17.82	\$0.00	\$72.95
DEMO: CONCRETE CUTTER/SAWYER	12/01/2022	\$44.22	¢0.10	\$17.57	\$0.00	¢71.00
LABORERS - ZONE I	12/01/2022	\$44.33	\$9.10	\$17.37	\$0.00	\$71.00
	06/01/2023 12/01/2023	\$44.73	\$9.40	\$17.82	\$0.00	\$71.95 \$73.20
For apprentice rates see "Apprentice- LABORER"	12/01/2023	\$45.98	\$9.40	\$17.62	\$0.00	\$73.20
DEMO: JACKHAMMER OPERATOR	12/01/2022	\$44.08	\$9.10	\$17.57	\$0.00	\$70.75
LABORERS - ZONE 1	06/01/2023	\$44.48	\$9.40	\$17.82	\$0.00	\$71.70
	12/01/2023	\$45.73	\$9.40	\$17.82	\$0.00	\$72.95
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER LABORERS - ZONE 1	12/01/2022	\$43.33	\$9.10	\$17.57	\$0.00	\$70.00
LABORERS - ZOIVE I	06/01/2023	\$43.73	\$9.40	\$17.82	\$0.00	\$70.95
	12/01/2023	\$44.98	\$9.40	\$17.82	\$0.00	\$72.20
For apprentice rates see "Apprentice- LABORER" DIDECTIONAL DRILL MACCHINE OPERATOR				****		
DIRECTIONAL DRILL MACHINE OPERATOR OPERATING ENGINEERS LOCAL 4	12/01/2022	\$53.05	\$14.25	\$16.05	\$0.00	\$83.35
	06/01/2023	\$54.29	\$14.25	\$16.05	\$0.00	\$84.59
	12/01/2023	\$55.53	\$14.25	\$16.05	\$0.00	\$85.83
	06/01/2024	\$56.81	\$14.25	\$16.05	\$0.00	\$87.11
	12/01/2024	\$58.25	\$14.25	\$16.05	\$0.00	\$88.55
	06/01/2025	\$59.53	\$14.25	\$16.05	\$0.00	\$89.83
	12/01/2025	\$60.97	\$14.25	\$16.05	\$0.00	\$91.27
	06/01/2026	\$62.25	\$14.25	\$16.05	\$0.00	\$92.55
For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2026	\$63.69	\$14.25	\$16.05	\$0.00	\$93.99
DIVER	08/01/2020	\$68.70	\$9.40	\$23.12	\$0.00	\$101.22
PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2020	\$00.70	φ 9.4 0	Ψ23.12	\$0.00	\$101.22
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2020	\$49.07	\$9.40	\$23.12	\$0.00	\$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2020	\$73.60	\$9.40	\$23.12	\$0.00	\$106.12
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2020	\$103.05	\$9.40	\$23.12	\$0.00	\$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) DRAWBRIDGE - SEIU LOCAL 888	07/01/2020	\$26.77	\$6.67	\$3.93	\$0.16	\$37.53
ELECTRICIAN ELECTRICIANS LOCAL 103	03/01/2023	\$59.23	\$13.00	\$21.63	\$0.00	\$93.86

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Supplemental Pension Unemployment

Apprentice -	ELECTRICIAN - Local 103
Effective Date	03/01/2023

	re Date - 03/01/2023				Supplemental	
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	40	\$23.69	\$13.00	\$0.71	\$0.00	\$37.40
2	40	\$23.69	\$13.00	\$0.71	\$0.00	\$37.40
3	45	\$26.65	\$13.00	\$16.13	\$0.00	\$55.78
4	45	\$26.65	\$13.00	\$16.13	\$0.00	\$55.78
5	50	\$29.62	\$13.00	\$16.63	\$0.00	\$59.25
6	55	\$32.58	\$13.00	\$17.13	\$0.00	\$62.71
7	60	\$35.54	\$13.00	\$17.63	\$0.00	\$66.17
8	65	\$38.50	\$13.00	\$18.13	\$0.00	\$69.63
9	70	\$41.46	\$13.00	\$18.62	\$0.00	\$73.08
10	75	\$44.42	\$13.00	\$19.13	\$0.00	\$76.55
Notes:						
į	App Prior 1/1/03; 30/35/40/45/50/	55/65/70/75/80				i
Appren	tice to Journeyworker Ratio:2:33	***				
EVATOR CONSTRU		01/01/2022	2 \$65.0	52 \$16.03	\$20.21 \$	0.00 \$101.86

Apprentice - ELEVATOR CONSTRUCTOR - Local 4

Effecti	ve Date - 01/01/2022				Supplemental	
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	50	\$32.81	\$16.03	\$0.00	\$0.00	\$48.84
2	55	\$36.09	\$16.03	\$20.21	\$0.00	\$72.33
3	65	\$42.65	\$16.03	\$20.21	\$0.00	\$78.89
4	70	\$45.93	\$16.03	\$20.21	\$0.00	\$82.17
5	80	\$52.50	\$16.03	\$20.21	\$0.00	\$88.74
Notes:						
	Steps 1-2 are 6 mos.; Steps 3-5 are 1 y	rear				İ
Appre	ntice to Journeyworker Ratio:1:1	. — — — — .				
EVATOR CONSTRU	JCTOR HELPER	01/01/2022	\$45.93	3 \$16.03	\$20.21	\$0.00 \$82.17

ELEVATOR CONSTRUCTORS LOCAL 4 For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"

Issue Date: 05/26/2023

Wage Request Number:

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY)	12/01/2022	\$42.83	\$9.35	\$17.82	\$0.00	\$70.00
LABORERS - ZONE 1 (HEAVY & HIGHWAY)	06/01/2023	\$43.83	\$9.40	\$17.82	\$0.00	\$71.05
	12/01/2023	\$45.08	\$9.40	\$17.82	\$0.00	\$72.30
	06/01/2024	\$46.56	\$9.40	\$17.82	Unemployment \$0.00 \$0.00	\$73.78
	12/01/2024	\$48.03	\$9.40	\$17.82		\$75.25
	06/01/2025	\$49.53	\$9.40	\$17.82	\$0.00	\$76.75
	12/01/2025	\$51.03	\$9.40	\$17.82	\$0.00	\$78.25
	06/01/2026	\$52.58	\$9.40	\$17.82	\$0.00	\$79.80
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	12/01/2026	\$54.08	\$9.40	\$17.82	\$0.00	\$81.30
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY	05/01/2023	\$49.91	\$14.25	\$16.05	\$0.00	\$80.21
OPERATING ENGINEERS LOCAL 4	11/01/2023	\$51.15	\$14.25	\$16.05		\$81.45
	05/01/2024	\$52.39	\$14.25	\$16.05		\$82.69
	11/01/2024	\$53.68	\$14.25	\$16.05		\$83.98
	05/01/2025	\$55.12	\$14.25	\$16.05		\$85.42
	11/01/2025	\$56.41	\$14.25	\$16.05	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$86.71
	05/01/2026	\$57.85	\$14.25	\$16.05	\$0.00	\$88.15
	11/01/2026	\$59.14	\$14.25	\$16.05	\$0.00	\$89.44
For apprentice rates see "Apprentice- OPERATING ENGINEERS"	05/01/2027	\$60.57	\$14.25	\$16.05	\$0.00	\$90.87
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY	05/01/2023	\$51.47	\$14.25	\$16.05	\$0.00	\$81.77
OPERATING ENGINEERS LOCAL 4	11/01/2023	\$52.72	\$14.25	\$16.05		\$83.02
	05/01/2024	\$52.72 \$53.97	\$14.25	\$16.05		\$83.02
	11/01/2024	\$55.27	\$14.25	\$16.05		\$85.57
	05/01/2025	\$56.72	\$14.25	\$16.05		\$87.02
	11/01/2025	\$58.02	\$14.25	\$16.05		\$88.32
	05/01/2026	\$59.47	\$14.25	\$16.05		\$89.77
	11/01/2026	\$60.77	\$14.25	\$16.05		\$91.07
	05/01/2027	\$62.22	\$14.25	\$16.05		\$92.52
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY OPERATING ENGINEERS LOCAL 4	05/01/2023	\$25.05	\$14.25	\$16.05	\$0.00	\$55.35
	11/01/2023	\$25.78	\$14.25	\$16.05		\$56.08
	05/01/2024	\$26.51	\$14.25	\$16.05		\$56.81
	11/01/2024	\$27.27	\$14.25	\$16.05		\$57.57
	05/01/2025	\$28.12	\$14.25	\$16.05		\$58.42
	11/01/2025	\$28.88	\$14.25	\$16.05		\$59.18
	05/01/2026	\$29.73	\$14.25	\$16.05		\$60.03
	11/01/2026	\$30.49	\$14.25	\$16.05		\$60.79
For apprentice rates see "Apprentice- OPERATING ENGINEERS"	05/01/2027	\$31.34	\$14.25	\$16.05	\$0.00	\$61.64
FIRE ALARM INSTALLER ELECTRICIANS LOCAL 103	03/01/2023	\$59.23	\$13.00	\$21.63	\$0.00	\$93.86
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONINGELECTRICIANS	03/01/2023	\$48.34	\$13.00	\$19.01	\$0.00	\$80.35
LOCAL 103 For apprentice rates see "Apprentice-TELECOMMUNICATIONS TECHNICIAN	٧"					

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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIREMAN (ASST. ENGINEER)	12/01/2022	\$43.54	\$14.25	\$16.05	\$0.00	\$73.84
OPERATING ENGINEERS LOCAL 4	06/01/2023	\$44.56	\$14.25	\$16.05	\$0.00	\$74.86
	12/01/2023	\$45.57	\$14.25	\$16.05	\$0.00	\$75.87
	06/01/2024	\$46.63	\$14.25	\$16.05	\$0.00	\$76.93
	12/01/2024	\$47.81	\$14.25	\$16.05	\$0.00	\$78.11
	06/01/2025	\$48.87	\$14.25	\$16.05	\$0.00	\$79.17
	12/01/2025	\$50.04	\$14.25	\$16.05	\$0.00	\$80.34
	06/01/2026	\$51.10	\$14.25	\$16.05	\$0.00	\$81.40
	12/01/2026	\$52.28	\$14.25	\$16.05	\$0.00	\$82.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER (HEAVY & HIGHWAY)	12/01/2022	\$25.23	\$9.35	\$17.82	\$0.00	\$52.40
LABORERS - ZONE 1 (HEAVY & HIGHWAY)	06/01/2023	\$25.98	\$9.40	\$17.82	\$0.00	\$53.20
	12/01/2023	\$25.98	\$9.40	\$17.82	\$0.00	\$53.20
	06/01/2024	\$27.01	\$9.40	\$17.82	\$0.00	\$54.23
	12/01/2024	\$27.01	\$9.40	\$17.82	\$0.00	\$54.23
	06/01/2025	\$28.09	\$9.40	\$17.82	\$0.00	\$55.31
	12/01/2025	\$28.09	\$9.40	\$17.82	\$0.00	\$55.31
	06/01/2026	\$29.21	\$9.40	\$17.82	\$0.00	\$56.43
	12/01/2026	\$29.21	\$9.40	\$17.82	\$0.00	\$56.43
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
FLOORCOVERER FLOORCOVERERS LOCAL 2168 ZONE I	03/01/2022	\$51.77	\$9.33	\$20.27	\$0.00	\$81.37

Apprentice - FLOORCOVERER - Local 2168 Zone I

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.89	\$9.33	\$1.79	\$0.00	\$37.01
2	55	\$28.47	\$9.33	\$1.79	\$0.00	\$39.59
3	60	\$31.06	\$9.33	\$14.90	\$0.00	\$55.29
4	65	\$33.65	\$9.33	\$14.90	\$0.00	\$57.88
5	70	\$36.24	\$9.33	\$16.69	\$0.00	\$62.26
6	75	\$38.83	\$9.33	\$16.69	\$0.00	\$64.85
7	80	\$41.42	\$9.33	\$18.48	\$0.00	\$69.23
8	85	\$44.00	\$9.33	\$18.48	\$0.00	\$71.81

% After 10/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps) Step 1&2 \$32.94/ 3&4 \$39.66/ 5&6 \$60.32/ 7&8 \$67.10

Apprentice to Journeyworker Ratio:1:1

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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FORK LIFT/CHERRY PICKER	12/01/2022	\$53.63	\$14.25	\$16.05	\$0.00	\$83.93
OPERATING ENGINEERS LOCAL 4	06/01/2023	\$54.88	\$14.25	\$16.05	\$0.00	\$85.18
	12/01/2023	\$56.13	\$14.25	\$16.05	\$0.00	\$86.43
	06/01/2024	\$57.43	\$14.25	\$16.05	\$0.00	\$87.73
	12/01/2024	\$58.88	\$14.25	\$16.05	\$0.00	\$89.18
	06/01/2025	\$60.18	\$14.25	\$16.05	\$0.00	\$90.48
	12/01/2025	\$61.63	\$14.25	\$16.05	\$0.00	\$91.93
	06/01/2026	\$62.93	\$14.25	\$16.05	\$0.00	\$93.23
For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2026	\$64.38	\$14.25	\$16.05	\$0.00	\$94.68
GENERATOR/LIGHTING PLANT/HEATERS	12/01/2022	\$35.08	\$14.25	\$16.05	\$0.00	\$65.38
OPERATING ENGINEERS LOCAL 4	06/01/2023	\$35.90	\$14.25	\$16.05	\$0.00	\$66.20
	12/01/2023	\$36.72	\$14.25	\$16.05	\$0.00	\$67.02
	06/01/2024	\$37.57	\$14.25	\$16.05	\$0.00	\$67.87
	12/01/2024	\$38.52	\$14.25	\$16.05	\$0.00	\$68.82
	06/01/2025	\$39.37	\$14.25	\$16.05	\$0.00	\$69.67
	12/01/2025	\$40.32	\$14.25	\$16.05	\$0.00	\$70.62
	06/01/2026	\$41.18	\$14.25	\$16.05	\$0.00	\$71.48
For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2026	\$42.13	\$14.25	\$16.05	\$0.00	\$72.43
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR	01/01/2023	\$45.56	\$8.65	\$23.05	\$0.00	\$77.26
SYSTEMS)	07/01/2023	\$46.76	\$8.65	\$23.05	\$0.00	\$78.46
GLAZIERS LOCAL 35 (ZONE 2)	01/01/2024	\$47.96	\$8.65	\$23.05	\$0.00	\$79.66
	07/01/2024	\$49.16	\$8.65	\$23.05	\$0.00	\$80.86
	01/01/2025	\$50.36	\$8.65	\$23.05	\$0.00	\$82.06

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Total Rate

Apprentice - GLAZIER - Local 35 Zone 2

Unemployment

	Effective Date -					Supplemental			
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50		\$22.78	\$8.65	\$0.00	\$0.00	\$31.43	
	2	55		\$25.06	\$8.65	\$6.27	\$0.00	\$39.98	
	3	60		\$27.34	\$8.65	\$6.84	\$0.00	\$42.83	
	4	65		\$29.61	\$8.65	\$7.41	\$0.00	\$45.67	
	5	70		\$31.89	\$8.65	\$19.63	\$0.00	\$60.17	
	6	75		\$34.17	\$8.65	\$20.20	\$0.00	\$63.02	
	7	80		\$36.45	\$8.65	\$20.77	\$0.00	\$65.87	
	8	90		\$41.00	\$8.65	\$21.91	\$0.00	\$71.56	
	Effect	ive Date -	07/01/2023				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50		\$23.38	\$8.65	\$0.00	\$0.00	\$32.03	
	2	55		\$25.72	\$8.65	\$6.27	\$0.00	\$40.64	
	3	60		\$28.06	\$8.65	\$6.84	\$0.00	\$43.55	
	4	65		\$30.39	\$8.65	\$7.41	\$0.00	\$46.45	
	5	70		\$32.73	\$8.65	\$19.63	\$0.00	\$61.01	
	6	75		\$35.07	\$8.65	\$20.20	\$0.00	\$63.92	
	7	80		\$37.41	\$8.65	\$20.77	\$0.00	\$66.83	
	8	90		\$42.08	\$8.65	\$21.91	\$0.00	\$72.64	
	Notes:								
		Steps are	750 hrs.					į	
	Appre	entice to Jou	urneyworker Ratio:1:1						
DISTING EI ERATING ENC			S/GRADALLS	12/01/2022	\$53.63	3 \$14.25	\$16.05	\$0.00	\$83.93
KAIING ENC	JINEEKS L	OCAL 4		06/01/2023	\$54.88	8 \$14.25	\$16.05	\$0.00	\$85.18
				12/01/2023	\$56.13	3 \$14.25	\$16.05	\$0.00	\$86.43
				06/01/2024	\$57.43	3 \$14.25	\$16.05	\$0.00	\$87.73
				12/01/2024	\$58.88	8 \$14.25	\$16.05	\$0.00	\$89.18
				06/01/2025	\$60.18	8 \$14.25	\$16.05	\$0.00	\$90.48
				12/01/2025	\$61.63	3 \$14.25	\$16.05	\$0.00	\$91.93
				06/01/2026	\$62.93	3 \$14.25	\$16.05	\$0.00	\$93.23
				12/01/2026	\$64.38	8 \$14.25	\$16.05	\$0.00	\$94.68

	Step	ive Date - 12/01/2022 percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
	1	55	\$29.50	\$14.25	\$0.00	\$0.00	\$43.75	
	2	60	\$32.18	\$14.25	\$16.05	\$0.00	\$62.48	
	3	65	\$34.86	\$14.25	\$16.05	\$0.00	\$65.16	
	4	70	\$37.54	\$14.25	\$16.05	\$0.00	\$67.84	
	5	75	\$40.22	\$14.25	\$16.05	\$0.00	\$70.52	
	6	80	\$42.90	\$14.25	\$16.05	\$0.00	\$73.20	
	7	85	\$45.59	\$14.25	\$16.05	\$0.00	\$75.89	
	8	90	\$48.27	\$14.25	\$16.05	\$0.00	\$78.57	
	Effecti Step	ive Date - 06/01/2023	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
	$\frac{3 c_{\rm P}}{1}$	55	\$30.18	\$14.25	\$0.00		\$44.43	
	2	60	\$30.18 \$32.93	\$14.25 \$14.25	\$0.00 \$16.05	\$0.00 \$0.00	\$63.23	
	3	65	\$32.93 \$35.67	\$14.25 \$14.25	\$16.05 \$16.05	\$0.00	\$65.23 \$65.97	
	4	70	\$38.42	\$14.25 \$14.25	\$16.05	\$0.00	\$63.97 \$68.72	
	5	75	\$41.16	\$14.25 \$14.25	\$16.05	\$0.00	\$71.46	
	6	80	\$43.90	\$14.25 \$14.25	\$16.05	\$0.00	\$74.20	
	7	85	\$46.65	\$14.25	\$16.05	\$0.00	\$74.20 \$76.95	
	8	90	\$49.39	\$14.25	\$16.05	\$0.00	\$70.93 \$79.69	
	Notes:							
	Appre	ntice to Journeyworker Ratio:1:6					'	
HVAC (DUCT	,		02/01/2023	3 \$55.31	\$14.11	\$26.64	\$2.83	\$98.89
SHEETMETAL WC	ORKERS LO	OCAL 17 - A	08/01/2023	3 \$57.01	\$14.11	\$26.64	\$2.83	\$100.59
			02/01/2024	4 \$58.71	\$14.11	\$26.64	\$2.83	\$102.29
			08/01/2024	4 \$60.46	\$14.11	\$26.64	\$2.83	\$104.04
			02/01/2025	5 \$62.21	\$14.11	\$26.64	\$2.83	\$105.79
			08/01/2025	5 \$64.06	\$14.11	\$26.64	\$2.83	\$107.64
For apprentice	e rates see '	'Apprentice- SHEET METAL WORKER"	02/01/2026	5 \$66.01	\$14.11	\$26.64	\$2.83	\$109.59
HVAC (ELECT	ΓRICAL	**	03/01/2023	3 \$59.23	\$13.00	\$21.63	\$0.00	\$93.86
		'Apprentice- ELECTRICIAN"						
) BALANCING - AIR)	02/01/2023	3 \$55.31	\$14.11	\$26.64	\$2.83	\$98.89
SHEETMETAL WO			08/01/2023			\$26.64	\$2.83	\$100.59
			02/01/2024			\$26.64	\$2.83	\$100.39
			08/01/2024			\$26.64	\$2.83	\$102.29
			02/01/2025			\$26.64	\$2.83	\$105.79
			02, 01, 2025	Ψ02.21	Ψ11.11			Ţ100.17
			08/01/2025	5 \$64.06	\$14.11	\$26.64	\$2.83	\$107.64

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER)	03/01/2023	\$63.43	\$12.50	\$20.80	\$0.00	\$96.73
PIPEFITTERS LOCAL 537	09/01/2023	\$65.18	\$12.50	\$20.80	\$0.00	\$98.48
	03/01/2024	\$66.98	\$12.50	\$20.80	\$0.00	\$100.28
	09/01/2024	\$68.78	\$12.50	\$20.80	\$0.00	\$102.08
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"	03/01/2025	\$70.58	\$12.50	\$20.80	\$0.00	\$103.88
HVAC MECHANIC	03/01/2023	\$63.43	\$12.25	\$20.80	\$0.00	\$96.48
PIPEFITTERS LOCAL 537	09/01/2023	\$65.18	\$12.25	\$20.80	\$0.00	\$98.23
	03/01/2024	\$66.98	\$12.25	\$20.80	\$0.00	\$100.03
	09/01/2024	\$68.78	\$12.25	\$20.80	\$0.00	\$101.83
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"	03/01/2025	\$70.58	\$12.25	\$20.80	\$0.00	\$103.63
YDRAULIC DRILLS ABORERS - ZONE 1	12/01/2022	\$43.93	\$9.10	\$17.57	\$0.00	\$70.60
LABORERS - ZONE 1	06/01/2023	\$44.33	\$9.40	\$17.82	\$0.00	\$71.55
	12/01/2023	\$45.58	\$9.40	\$17.82	\$0.00	\$72.80
For apprentice rates see "Apprentice- LABORER"						
HYDRAULIC DRILLS (HEAVY & HIGHWAY)	12/01/2022	\$43.33	\$9.35	\$17.82	\$0.00	\$70.50
LABORERS - ZONE 1 (HEAVY & HIGHWAY)	06/01/2023	\$44.33		\$71.55		
	12/01/2023	\$45.58	\$9.40	\$17.82	\$0.00	\$72.80
	06/01/2024	\$47.06	\$9.40	\$17.82	\$0.00	\$74.28
	12/01/2024	\$48.53	\$9.40	\$17.82	\$0.00	\$75.75
	06/01/2025	\$50.03	\$9.40	\$17.82	\$0.00	\$77.25
	12/01/2025	\$51.53	\$9.40	\$17.82	\$0.00	\$78.75
	06/01/2026	\$53.08	\$9.40	\$17.82	\$0.00	\$80.30
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	12/01/2026	\$54.58	\$9.40	\$17.82	\$0.00	\$81.80
INSULATOR (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 (BOSTON)	09/01/2022	\$53.85	\$13.80	\$17.14	\$0.00	\$84.79

Apprentice -	ASBESTOS INSULATOR (Pipes of	& Tanks) - Local 6 Boston
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Effectiv	ve Date - 09/01/2022				Supplemental		
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50	\$26.93	\$13.80	\$12.42	\$0.00	\$53.15	
2	60	\$32.31	\$13.80	\$13.36	\$0.00	\$59.47	
3	70	\$37.70	\$13.80	\$14.31	\$0.00	\$65.81	
4	80	\$43.08	\$13.80	\$15.25	\$0.00	\$72.13	
Notes:							
i	Steps are 1 year						
Apprer	ntice to Journeyworker Ratio:1:4					'	
IRONWORKER/WELD		03/16/2023	3 \$52.72	2 \$8.35	\$26.70	Soloyment Total Rate \$0.00 \$53.15 \$0.00 \$59.47 \$0.00 \$65.81 \$0.00 \$72.13	
IRONWORKERS LOCAL 7 (BC	OSTON AREA)	03/16/2024	\$53.97	\$8.35	\$26.70	\$0.00	\$89.02

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Pension

Total Rate

	Step	ive Date - 03/16/2023 percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
	$\frac{\operatorname{step}}{1}$	60	\$31.63	\$8.35	\$26.70	\$0.00	\$66.68	
	2	70	\$36.90	\$8.35	\$26.70	\$0.00	\$71.95	
	3	75	\$39.54	\$8.35	\$26.70	\$0.00	\$71.55 \$74.59	
	4	80	\$42.18	\$8.35	\$26.70	\$0.00	\$77.23	
	5	85	\$44.81	\$8.35	\$26.70	\$0.00	\$79.86	
	6	90	\$47.45	\$8.35	\$26.70	\$0.00	\$82.50	
	Effect:	ive Date - 03/16/2024 percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
	1	60	\$32.38	\$8.35	\$26.70	\$0.00	\$67.43	
	2	70	\$37.78	\$8.35	\$26.70	\$0.00	\$72.83	
	3	75	\$40.48	\$8.35	\$26.70	\$0.00	\$75.53	
	4	80	\$43.18	\$8.35	\$26.70	\$0.00	\$78.23	
	5	85	\$45.87	\$8.35	\$26.70	\$0.00	\$80.92	
	6	90	\$48.57	\$8.35	\$26.70	\$0.00	\$83.62	
	Notes:	-						
	Appre	ntice to Journeyworker Ratio:1:4						
СКНАММЕ	CKHAMMER & PAVING BREAKER OPERATOR		12/01/2022	2 \$43.43	\$9.10	\$17.57	\$0.00	\$70.10
BORERS - ZONI	E 1		06/01/2023			\$17.82	\$0.00	\$71.05
			12/01/2023			\$17.82	\$0.00	\$72.30
For apprentice	e rates see '	'Apprentice- LABORER"						
BORER BORERS - ZONI	E I		12/01/2022	\$43.18	\$9.10	\$17.57	\$0.00	\$69.85
OKEKS - ZUNI	L 1		06/01/2023	\$43.58	\$9.40	\$17.82	\$0.00	\$70.80
			12/01/2023	\$44.83	\$9.40	\$17.82	\$0.00	\$72.05

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Pension

Total Rate

\$76.50

\$78.00

\$79.55

\$81.05

06/01/2025

12/01/2025

06/01/2026

12/01/2026

\$49.28

\$50.78

\$52.33

\$53.83

\$9.40

\$9.40

\$9.40

\$9.40

\$17.82

\$17.82

\$17.82

\$0.00

\$0.00

\$0.00

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Total Rate

ABORERS - ZONE 1 06/01/2023 \$43.58 \$9.40 \$17.82 \$0.00 \$70.80	Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Principage 1900 1	LABORER: MULTI-TRADE TENDER	12/01/2022	\$43.18	\$9.10	\$17.57	\$0.00	\$69.85
Page Page	LABORERS - ZONE I	06/01/2023	\$43.58	\$9.40	\$17.82	\$0.00	\$70.80
LABORER: TREE REMOVER		12/01/2023	\$44.83	\$9.40	\$17.82	\$0.00	\$72.05
ABORERS - ZONE 1 O6/01/2023 \$43.58 \$9.40 \$17.82 \$0.00 \$70.80	For apprentice rates see "Apprentice- LABORER"						
1/201/2023 343.58 59.40 \$17.82 \$0.00 \$70.80 1/201/2023 343.58 \$9.40 \$17.82 \$0.00 \$70.80 1/201/2023 344.83 \$9.40 \$17.82 \$0.00 \$70.10 1/201/2023 344.83 \$9.40 \$17.82 \$0.00 \$70.10 1/201/2023 \$43.33 \$9.40 \$17.82 \$0.00 \$70.10 1/201/2023 \$43.33 \$9.40 \$17.82 \$0.00 \$70.10 1/201/2023 \$43.83 \$9.40 \$17.82 \$0.00 \$70.10 1/201/2023 \$43.83 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2023 \$45.08 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2023 \$45.08 \$9.40 \$17.82 \$0.00 \$70.00 1/201/2023 \$45.08 \$9.40 \$17.82 \$0.00 \$70.00 1/201/2023 \$45.08 \$9.40 \$17.82 \$0.00 \$70.00 1/201/2024 \$46.56 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2025 \$45.08 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2024 \$46.56 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2025 \$49.53 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2025 \$49.53 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2025 \$49.53 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2025 \$51.03 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2025 \$51.03 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2025 \$51.03 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2026 \$49.53 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2026 \$49.53 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2025 \$51.03 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2026 \$40.80 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2026 \$40.80 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2026 \$40.80 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2026 \$40.80 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2026 \$40.80 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2026 \$40.80 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2026 \$40.80 \$9.40 \$17.82 \$0.00 \$70.20 1/201/2026 \$40.80 \$11.49 \$20.37 \$0.00 \$80.20 1/201/2026 \$40.80 \$11.49 \$20.37 \$0.00 \$80.20 1/201/2026 \$40.80 \$11.49 \$20.37 \$0.00 \$80.20 1/201/2026 \$40.80 \$11.49 \$20.37 \$0.00 \$80.20 1/201/2026	LABORER: TREE REMOVER	12/01/2022	\$43.18	\$9.10	\$17.57	\$0.00	\$69.85
This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or six clearance incidental to construction. For apprentice rates see "Apprentice rates see "Apprentice rates see "Apprentice-LABORER" 12/01/2023 \$43.43 \$9.40 \$17.82 \$0.00 \$72.30	LABORERS - ZONE I	06/01/2023	\$43.58	\$9.40	\$17.82	\$0.00	\$70.80
Classific Ream Construction For apprentice rates see "Apprentice-LABORER" 12/01/2022 \$43.43 \$9.10 \$17.57 \$0.00 \$70.10		12/01/2023	\$44.83	\$9.40	\$17.82	\$0.00	\$72.05
12/01/2023 \$43.83 \$9.40 \$17.82 \$0.00 \$71.05 12/01/2023 \$43.83 \$9.40 \$17.82 \$0.00 \$72.30 For apprentice rates see "Apprentice-LABORER" 12/01/2022 \$42.83 \$9.35 \$17.82 \$0.00 \$70.00 LABORERS - ZONE (HEAVY & HIGHWAY) 12/01/2022 \$42.83 \$9.35 \$17.82 \$0.00 \$71.05 12/01/2023 \$43.83 \$9.40 \$17.82 \$0.00 \$71.05 12/01/2023 \$43.83 \$9.40 \$17.82 \$0.00 \$71.05 12/01/2023 \$45.08 \$9.40 \$17.82 \$0.00 \$72.30 12/01/2024 \$46.56 \$9.40 \$17.82 \$0.00 \$73.78 12/01/2024 \$48.03 \$9.40 \$17.82 \$0.00 \$73.78 12/01/2025 \$49.53 \$9.40 \$17.82 \$0.00 \$75.25 12/01/2025 \$49.53 \$9.40 \$17.82 \$0.00 \$76.75 12/01/2025 \$51.03 \$9.40 \$17.82 \$0.00 \$76.75 12/01/2026 \$52.58 \$9.40 \$17.82 \$0.00 \$78.25 12/01/2026 \$55.03 \$9.40 \$17.82 \$0.00 \$78.25 12/01/2026 \$55.03 \$9.40 \$17.82 \$0.00 \$79.80 12/01/2026 \$55.03 \$9.40 \$17.82 \$0.00 \$79.80 12/01/2026 \$55.08 \$9.40 \$17.82 \$0.00 \$79.80 12/01/2026 \$55.08 \$9.40 \$17.82 \$0.00 \$79.80 12/01/2026 \$55.08 \$9.40 \$17.82 \$0.00 \$79.80 12/01/2026 \$55.08 \$9.40 \$17.82 \$0.00 \$79.80 12/01/2026 \$55.08 \$9.40 \$17.82 \$0.00 \$79.80 12/01/2026 \$55.08 \$9.40 \$17.82 \$0.00 \$79.75 12/01/2026 \$55.08 \$9.40 \$17.82 \$0.00 \$79.75 12/01/2026 \$55.08 \$9.40 \$17.82 \$0.00 \$79.75 12/01/2026 \$55.07 \$11.49 \$20.37 \$0.00 \$80.75 12/01/2026 \$55.07 \$11.49 \$20.37 \$0.00 \$83.47 12/01/2026 \$55.41 \$11.49 \$20.37 \$0.00 \$83.47 12/01/2026 \$55.41 \$11.49 \$20.37 \$0.00 \$86.27 12/01/2026 \$55.41 \$11.49 \$20.37 \$0.00 \$86.27 12/01/2026 \$55.41 \$11.49 \$20.37 \$0.00 \$86.27 12/01/2026 \$55.41 \$11.49 \$20.37 \$0.00 \$86.27 12/01/2026 \$55.41 \$11.49 \$20.37 \$0.00 \$86.27 12/01/2026 \$55.617 \$11.49 \$20.37 \$0.00 \$86.27 12/01/2026 \$56.17 \$11.49 \$20			bs when related	to public work	s construction	or site	
Por apprentice rates see "Apprentice- LABORER"	LASER BEAM OPERATOR	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
For apprentice rates see "Apprentice- LABORER" LASER BEAM OPERATOR (HEAVY & HIGHWAY) 12/01/2022 \$42.83 \$9.35 \$17.82 \$0.00 \$70.00 \$1.05 \$1.05 \$1.20 \$	LABUKEKS - ZUNE I	06/01/2023	\$43.83	\$9.40	\$17.82	\$0.00	\$71.05
LASER BEAM OPERATOR (HEAVY & HIGHWAY) 12/01/2022 \$42.83 \$9.35 \$17.82 \$0.00 \$70.00 \$06/01/2023 \$43.83 \$9.40 \$17.82 \$0.00 \$71.05 \$12/01/2023 \$43.83 \$9.40 \$17.82 \$0.00 \$71.05 \$12/01/2023 \$45.08 \$9.40 \$17.82 \$0.00 \$72.30 \$06/01/2024 \$46.56 \$9.40 \$17.82 \$0.00 \$73.78 \$12/01/2024 \$48.03 \$9.40 \$17.82 \$0.00 \$73.78 \$12/01/2024 \$48.03 \$9.40 \$17.82 \$0.00 \$75.25 \$12/01/2025 \$49.53 \$9.40 \$17.82 \$0.00 \$75.25 \$12/01/2025 \$51.03 \$9.40 \$17.82 \$0.00 \$76.75 \$12/01/2025 \$51.03 \$9.40 \$17.82 \$0.00 \$78.25 \$12/01/2025 \$51.03 \$9.40 \$17.82 \$0.00 \$78.25 \$12/01/2026 \$52.58 \$9.40 \$17.82 \$0.00 \$78.25 \$12/01/2026 \$52.58 \$9.40 \$17.82 \$0.00 \$79.80 \$12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$79.80 \$12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$79.80 \$12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$79.80 \$12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$79.80 \$12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$79.80 \$12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$79.80 \$12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$79.80 \$12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$79.75 \$12/01/2024 \$48.89 \$11.49 \$20.37 \$0.00 \$79.75 \$11.49 \$20.37 \$0.00 \$80.75 \$11.49 \$11		12/01/2023	\$45.08	\$9.40	\$17.82	\$0.00	\$72.30
ABORERS - ZONE 1 (HEAVY & HIGHWAY)	For apprentice rates see "Apprentice- LABORER"						
06/01/2023 \$43.83 \$9.40 \$17.82 \$0.00 \$71.05 12/01/2023 \$45.08 \$9.40 \$17.82 \$0.00 \$72.30 06/01/2024 \$46.56 \$9.40 \$17.82 \$0.00 \$73.78 12/01/2024 \$48.03 \$9.40 \$17.82 \$0.00 \$75.25 06/01/2025 \$49.53 \$9.40 \$17.82 \$0.00 \$76.75 12/01/2025 \$51.03 \$9.40 \$17.82 \$0.00 \$76.75 12/01/2026 \$52.58 \$9.40 \$17.82 \$0.00 \$78.25 06/01/2026 \$52.58 \$9.40 \$17.82 \$0.00 \$79.80 12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$79.80 12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$79.80 12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$79.80 12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$79.80 12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$79.75 08/01/2024 \$48.89 \$11.49 \$20.37 \$0.00 \$79.75 08/01/2024 \$48.89 \$11.49 \$20.37 \$0.00 \$80.75 08/01/2025 \$551.61 \$11.49 \$20.37 \$0.00 \$83.47 08/01/2025 \$553.33 \$11.49 \$20.37 \$0.00 \$83.47 08/01/2026 \$54.41 \$11.49 \$20.37 \$0.00 \$85.19 02/01/2026 \$54.41 \$11.49 \$20.37 \$0.00 \$85.19 02/01/2026 \$54.41 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.41 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$86.27 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$80.00 08/01/2026 \$55.07 \$11.49 \$20.37 \$0.00 \$	LASER BEAM OPERATOR (HEAVY & HIGHWAY)	12/01/2022	\$42.83	\$9.35	\$17.82	\$0.00	\$70.00
06/01/2024 \$46.56 \$9.40 \$17.82 \$0.00 \$73.78	LABORERS - ZONE I (HEAV I & HIGHWAI)	06/01/2023	\$43.83	\$9.40	\$17.82	\$0.00	\$71.05
12/01/2024 \$48.03 \$9.40 \$17.82 \$0.00 \$75.25		12/01/2023	\$45.08	\$9.40	\$17.82	\$0.00	\$72.30
06/01/2025 \$49.53 \$9.40 \$17.82 \$0.00 \$76.75 12/01/2025 \$51.03 \$9.40 \$17.82 \$0.00 \$78.25 12/01/2026 \$52.58 \$9.40 \$17.82 \$0.00 \$79.80 12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$79.80 12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$81.30 For apprentice rates see "Apprentice- LABORER (Heavy and Highway) MARBLE & TILE FINISHERS 02/01/2023 \$46.25 \$11.49 \$20.37 \$0.00 \$78.11 08/01/2023 \$47.89 \$11.49 \$20.37 \$0.00 \$79.75 02/01/2024 \$48.89 \$11.49 \$20.37 \$0.00 \$80.75 08/01/2024 \$50.57 \$11.49 \$20.37 \$0.00 \$82.43 02/01/2025 \$51.61 \$11.49 \$20.37 \$0.00 \$83.47 08/01/2026 \$54.41 \$11.49 \$20.37 \$0.00 \$85.19 02/01/2026 \$54.41 \$11.49 \$20.37 \$0.00 \$86.27 08/01/2026 \$55.41 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.41 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.41 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.41 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.41 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.41 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$88.03 08/01/2026 \$55.17 \$11.49 \$20.37 \$0.00 \$80.00 08/01/2026 \$55.00 \$10.00 \$10.00 08/01/2026 \$55.00 \$1		06/01/2024	\$46.56	\$9.40	\$17.82	\$0.00	\$73.78
12/01/2025 \$51.03 \$9.40 \$17.82 \$0.00 \$78.25 \$0.01/2026 \$52.58 \$9.40 \$17.82 \$0.00 \$79.80 \$12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$81.30 \$12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$81.30 \$17.82 \$0.00 \$81.30 \$17.82 \$0.00 \$81.30 \$17.82 \$0.00 \$81.30 \$17.82 \$0.00 \$		12/01/2024	\$48.03	\$9.40	\$17.82	\$0.00	\$75.25
MARBLE & TILE FINISHERS 12/01/2023 14.25 11.49 11.49 12.037 11.49 11.4		06/01/2025	\$49.53	\$9.40	\$17.82	\$0.00	\$76.75
12/01/2026 \$54.08 \$9.40 \$17.82 \$0.00 \$81.30		12/01/2025	\$51.03	\$9.40	\$17.82	\$0.00	\$78.25
For apprentice rates see "Apprentice- LABORER (Heavy and Highway) MARBLE & TILE FINISHERS BRICKLAYERS LOCAL 3 - MARBLE & TILE 08/01/2023 \$46.25 \$11.49 \$20.37 \$0.00 \$78.11 08/01/2024 \$48.89 \$11.49 \$20.37 \$0.00 \$79.75 02/01/2024 \$48.89 \$11.49 \$20.37 \$0.00 \$80.75 08/01/2024 \$50.57 \$11.49 \$20.37 \$0.00 \$82.43 02/01/2025 \$51.61 \$11.49 \$20.37 \$0.00 \$83.47 08/01/2025 \$53.33 \$11.49 \$20.37 \$0.00 \$85.19 02/01/2026 \$54.41 \$11.49 \$20.37 \$0.00 \$86.27 08/01/2026 \$56.17 \$11.49 \$20.37 \$0.00 \$88.03		06/01/2026	\$52.58	\$9.40	\$17.82	\$0.00	\$79.80
MARBLE & TILE FINISHERS BRICKLAYERS LOCAL 3 - MARBLE & TILE 02/01/2023 \$46.25 \$11.49 \$20.37 \$0.00 \$78.11 08/01/2023 \$47.89 \$11.49 \$20.37 \$0.00 \$79.75 02/01/2024 \$48.89 \$11.49 \$20.37 \$0.00 \$80.75 08/01/2024 \$50.57 \$11.49 \$20.37 \$0.00 \$82.43 02/01/2025 \$51.61 \$11.49 \$20.37 \$0.00 \$83.47 08/01/2025 \$53.33 \$11.49 \$20.37 \$0.00 \$85.19 02/01/2026 \$54.41 \$11.49 \$20.37 \$0.00 \$86.27 08/01/2026 \$56.17 \$11.49 \$20.37 \$0.00 \$88.03		12/01/2026	\$54.08	\$9.40	\$17.82	\$0.00	\$81.30
BRICKLAYERS LOCAL 3 - MARBLE & TILE 08/01/2023 \$47.89 \$11.49 \$20.37 \$0.00 \$79.75 02/01/2024 \$48.89 \$11.49 \$20.37 \$0.00 \$80.75 08/01/2024 \$50.57 \$11.49 \$20.37 \$0.00 \$82.43 02/01/2025 \$51.61 \$11.49 \$20.37 \$0.00 \$83.47 08/01/2025 \$53.33 \$11.49 \$20.37 \$0.00 \$85.19 02/01/2026 \$54.41 \$11.49 \$20.37 \$0.00 \$86.27 08/01/2026 \$56.17 \$11.49 \$20.37 \$0.00 \$88.03	For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
08/01/2023 \$47.89 \$11.49 \$20.37 \$0.00 \$79.75 02/01/2024 \$48.89 \$11.49 \$20.37 \$0.00 \$80.75 08/01/2024 \$50.57 \$11.49 \$20.37 \$0.00 \$82.43 02/01/2025 \$51.61 \$11.49 \$20.37 \$0.00 \$83.47 08/01/2025 \$53.33 \$11.49 \$20.37 \$0.00 \$85.19 02/01/2026 \$54.41 \$11.49 \$20.37 \$0.00 \$86.27 08/01/2026 \$56.17 \$11.49 \$20.37 \$0.00 \$88.03	MARBLE & TILE FINISHERS	02/01/2023	\$46.25	\$11.49	\$20.37	\$0.00	\$78.11
08/01/2024 \$50.57 \$11.49 \$20.37 \$0.00 \$82.43 02/01/2025 \$51.61 \$11.49 \$20.37 \$0.00 \$83.47 08/01/2025 \$53.33 \$11.49 \$20.37 \$0.00 \$85.19 02/01/2026 \$54.41 \$11.49 \$20.37 \$0.00 \$86.27 08/01/2026 \$56.17 \$11.49 \$20.37 \$0.00 \$88.03	BRICKLAYERS LOCAL 3 - MARBLE & TILE	08/01/2023	\$47.89	\$11.49	\$20.37	\$0.00	\$79.75
02/01/2025 \$51.61 \$11.49 \$20.37 \$0.00 \$83.47 08/01/2025 \$53.33 \$11.49 \$20.37 \$0.00 \$85.19 02/01/2026 \$54.41 \$11.49 \$20.37 \$0.00 \$86.27 08/01/2026 \$56.17 \$11.49 \$20.37 \$0.00 \$88.03		02/01/2024	\$48.89	\$11.49	\$20.37	\$0.00	\$80.75
08/01/2025 \$53.33 \$11.49 \$20.37 \$0.00 \$85.19 02/01/2026 \$54.41 \$11.49 \$20.37 \$0.00 \$86.27 08/01/2026 \$56.17 \$11.49 \$20.37 \$0.00 \$88.03		08/01/2024	\$50.57	\$11.49	\$20.37	\$0.00	\$82.43
02/01/2026 \$54.41 \$11.49 \$20.37 \$0.00 \$86.27 08/01/2026 \$56.17 \$11.49 \$20.37 \$0.00 \$88.03		02/01/2025	\$51.61	\$11.49	\$20.37	\$0.00	\$83.47
08/01/2026 \$56.17 \$11.49 \$20.37 \$0.00 \$88.03		08/01/2025	\$53.33	\$11.49	\$20.37	\$0.00	\$85.19
		02/01/2026	\$54.41	\$11.49	\$20.37	\$0.00	\$86.27
		08/01/2026	\$56.17	\$11.49	\$20.37	\$0.00	\$88.03
			\$57.29	\$11.49	\$20.37	\$0.00	

 Issue Date:
 05/26/2023
 Wage Request Number:
 20230526-010
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Pension

Total Rate

Effecti	ive Date -	02/01/2023				Supplemental		
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50		\$23.13	\$11.49	\$20.37	\$0.00	\$54.99	
2	60		\$27.75	\$11.49	\$20.37	\$0.00	\$59.61	
3	70		\$32.38	\$11.49	\$20.37	\$0.00	\$64.24	
4	80		\$37.00	\$11.49	\$20.37	\$0.00	\$68.86	
5	90		\$41.63	\$11.49	\$20.37	\$0.00	\$73.49	
Effecti	ive Date -	08/01/2023				Supplemental		
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50		\$23.95	\$11.49	\$20.37	\$0.00	\$55.81	
2	60		\$28.73	\$11.49	\$20.37	\$0.00	\$60.59	
3	70		\$33.52	\$11.49	\$20.37	\$0.00	\$65.38	

4	80	\$38.31	\$11.49	\$20.37	\$0.00	\$70.17
5	90	\$43.10	\$11.49	\$20.37	\$0.00	\$74.96
Notes:						

Apprentice to Journeyworker Ratio:1:3

Apprentice - MARBLE & TILE FINISHER - Local 3 Marble & Tile

MARBLE MASONS, TILELAYERS & TERRAZZO MECH	02/01/2023	\$60.37	\$11.49	\$22.31	\$0.00	\$94.17
BRICKLAYERS LOCAL 3 - MARBLE & TILE	08/01/2023	\$62.42	\$11.49	\$22.31	\$0.00	\$96.22
	02/01/2024	\$63.67	\$11.49	\$22.31	\$0.00	\$97.47
	08/01/2024	\$65.77	\$11.49	\$22.31	\$0.00	\$99.57
	02/01/2025	\$67.07	\$11.49	\$22.31	\$0.00	\$100.87
	08/01/2025	\$69.22	\$11.49	\$22.31	\$0.00	\$103.02
	02/01/2026	\$70.57	\$11.49	\$22.31	\$0.00	\$104.37
	08/01/2026	\$72.77	\$11.49	\$22.31	\$0.00	\$106.57
	02/01/2027	\$74.17	\$11.49	\$22.31	\$0.00	\$107.97

Issue Date: 05/26/2023 **Wage Request Number:** 20230526-010 Page 22 of 41

Pension

Total Rate

	Appre	ntice - M	ARBLE-TILE-TERRAZZO	MECHANIC - Local 3 Ma	ırble & Tile				
		ve Date -	02/01/2023				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50		\$30.19	\$11.49	\$22.31	\$0.00	\$63.99	
	2	60		\$36.22	\$11.49	\$22.31	\$0.00	\$70.02	
	3	70		\$42.26	\$11.49	\$22.31	\$0.00	\$76.06	
	4	80		\$48.30	\$11.49	\$22.31	\$0.00	\$82.10	
	5	90		\$54.33	\$11.49	\$22.31	\$0.00	\$88.13	
		ve Date -	08/01/2023				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50		\$31.21	\$11.49	\$22.31	\$0.00	\$65.01	
	2	60		\$37.45	\$11.49	\$22.31	\$0.00	\$71.25	
	3	70		\$43.69	\$11.49	\$22.31	\$0.00	\$77.49	
	4	80		\$49.94	\$11.49	\$22.31	\$0.00	\$83.74	
	5	90		\$56.18	\$11.49	\$22.31	\$0.00	\$89.98	
	Notes:								
								İ	
			urneyworker Ratio:1:5						
MECH. SWEEL OPERATING ENGL			ON CONST. SITES)	12/01/2022	2 \$53.05	\$14.25	\$16.05	\$0.00	\$83.35
OI EKAIINO ENGI	WEEKS LO	JCAL 4		06/01/2023	3 \$54.29	\$14.25	\$16.05	\$0.00	\$84.59
				12/01/2023	3 \$55.53	\$14.25	\$16.05	\$0.00	\$85.83
				06/01/2024	4 \$56.81	\$14.25	\$16.05	\$0.00	\$87.11
				12/01/2024	4 \$58.25	\$14.25	\$16.05	\$0.00	\$88.55
				06/01/2023	5 \$59.53	\$14.25	\$16.05	\$0.00	\$89.83
				12/01/202	5 \$60.97	\$14.25	\$16.05	\$0.00	\$91.27
				06/01/2020	6 \$62.25	\$14.25	\$16.05	\$0.00	\$92.55
For apprentice	rates see '	'Apprentice- (DPERATING ENGINEERS"	12/01/2020	6 \$63.69	\$14.25	\$16.05	\$0.00	\$93.99
MECHANICS I				12/01/2022	2 \$53.05	\$14.25	\$16.05	\$0.00	\$83.35
OPERATING ENGI	NEERS LO	OCAL 4		06/01/2023	3 \$54.29	\$14.25	\$16.05	\$0.00	\$84.59
				12/01/2023	3 \$55.53	\$14.25	\$16.05	\$0.00	\$85.83
				06/01/2024	4 \$56.81	\$14.25	\$16.05	\$0.00	\$87.11
				12/01/2024	4 \$58.25	\$14.25	\$16.05	\$0.00	\$88.55
				06/01/2023	5 \$59.53	\$14.25	\$16.05	\$0.00	\$89.83
				12/01/202:	5 \$60.97	\$14.25	\$16.05	\$0.00	\$91.27
				06/01/2020	6 \$62.25	\$14.25	\$16.05	\$0.00	\$92.55
				12/01/2020	6 \$63.69	\$14.25	\$16.05	\$0.00	\$93.99
			OPERATING ENGINEERS"						
MILLWRIGHTS LO				01/02/2023	3 \$47.27	\$8.58	\$21.57	\$0.00	\$77.42

Total Rate

Apprentice - MILLWRIGHT - Local 1121 Zone 1 **Effective Date -**01/02/2023 Supplemental Apprentice Base Wage Health Unemployment Total Rate Step percent Pension 1 55 \$40.30 \$26.00 \$8.58 \$5.72 \$0.00 2 65 \$30.73 \$8.58 \$17.93 \$0.00 \$57.24 3 75 \$35.45 \$0.00 \$8.58 \$18.98 \$63.01 4 85 \$40.18 \$8.58 \$20.01 \$0.00 \$68.77 |Notes: Step 1&2 Appr. indentured after 1/6/2020 receive no pension, but do receive annuity. (Step 1 \$5.72, Step 2 \$6.66) Steps are 2,000 hours Apprentice to Journeyworker Ratio:1:4 MORTAR MIXER 12/01/2022 \$17.57 \$0.00 \$70.10 \$43.43 \$9.10 LABORERS - ZONE 1 06/01/2023 \$43.83 \$9.40 \$17.82 \$0.00 \$71.05 12/01/2023 \$45.08 \$9.40 \$17.82 \$0.00 \$72.30 For apprentice rates see "Apprentice- LABORER" OILER (OTHER THAN TRUCK CRANES, GRADALLS) \$16.05 \$0.00 12/01/2022 \$24.37 \$14.25 \$54.67 OPERATING ENGINEERS LOCAL 4 \$16.05 06/01/2023 \$24.94 \$14.25 \$0.00 \$55.24 12/01/2023 \$16.05 \$0.00 \$25.51 \$14.25 \$55.81 06/01/2024 \$26.11 \$14.25 \$16.05 \$0.00 \$56.41 12/01/2024 \$26.77 \$14.25 \$16.05 \$0.00 \$57.07 \$16.05 06/01/2025 \$27.37 \$14.25 \$0.00 \$57.67 \$16.05 \$0.00 12/01/2025 \$28.03 \$14.25 \$58.33 \$16.05 \$0.00 06/01/2026 \$28.62 \$14.25 \$58.92 12/01/2026 \$16.05 \$0.00 \$29.29 \$14.25 \$59.59 For apprentice rates see "Apprentice- OPERATING ENGINEERS" OILER (TRUCK CRANES, GRADALLS) \$16.05 \$0.00 12/01/2022 \$29.57 \$14.25 \$59.87 OPERATING ENGINEERS LOCAL 4 06/01/2023 \$30.27 \$14.25 \$16.05 \$0.00 \$60.57 12/01/2023 \$30.96 \$14.25 \$16.05 \$0.00 \$61.26 06/01/2024 \$16.05 \$0.00 \$31.68 \$14.25 \$61.98 \$0.00 \$16.05 12/01/2024 \$32.48 \$14.25 \$62.78 06/01/2025 \$33.20 \$14.25 \$16.05 \$0.00 \$63.50 \$16.05 \$0.00 12/01/2025 \$34.00 \$14.25 \$64.30 06/01/2026 \$14.25 \$16.05 \$0.00 \$65.02 \$34.72 \$16.05 \$0.00 12/01/2026 \$35.52 \$14.25 \$65.82 For apprentice rates see "Apprentice- OPERATING ENGINEERS" OTHER POWER DRIVEN EQUIPMENT - CLASS II \$16.05 12/01/2022 \$53.05 \$14.25 \$0.00 \$83.35 OPERATING ENGINEERS LOCAL 4 06/01/2023 \$54.29 \$14.25 \$16.05 \$0.00 \$84.59 12/01/2023 \$55.53 \$14.25 \$16.05 \$0.00 \$85.83 06/01/2024 \$56.81 \$14.25 \$16.05 \$0.00 \$87.11 \$16.05 \$0.00 12/01/2024 \$58.25 \$14.25 \$88.55 06/01/2025 \$16.05 \$0.00 \$59.53 \$14.25 \$89.83 \$16.05 12/01/2025 \$60.97 \$14.25 \$0.00 \$91.27 06/01/2026 \$16.05 \$0.00 \$62.25 \$14.25 \$92.55 12/01/2026 \$63.69 \$14.25 \$16.05 \$0.00 \$93.99

• • • • • • • • • • • • • • • • • • • •		**						
AINTER (E			01/01/2023	\$56.06	\$8.65	\$23.05	\$0.00	\$87.76
AINTERS LOC	AL 33 - ZONI	ž ∠	07/01/2023	\$57.26	\$8.65	\$23.05	\$0.00	\$88.96
			01/01/2024	\$58.46	\$8.65	\$23.05	\$0.00	\$90.16
			07/01/2024	\$59.66	\$8.65	\$23.05	\$0.00	\$91.36
			01/01/2025	\$60.86	\$8.65	\$23.05	\$0.00	\$92.56
		ntice - PAINTER Local 35 - BR	IDGES/TANKS					
		ive Date - 01/01/2023	A	11 141-	D	Supplemental Unemployment	T-4-1 D-4-	
	Step	percent	Apprentice Base Wage		Pension		Total Rate	
	1	50	\$28.03	\$8.65	\$0.00	\$0.00	\$36.68	
	2	55	\$30.83	\$8.65	\$6.27	\$0.00	\$45.75	
	3	60	\$33.64	\$8.65	\$6.84	\$0.00	\$49.13	
	4	65	\$36.44	\$8.65	\$7.41	\$0.00	\$52.50	
	5	70	\$39.24	\$8.65	\$19.63	\$0.00	\$67.52	
	6	75	\$42.05	\$8.65	\$20.20	\$0.00	\$70.90	
	7	80	\$44.85	\$8.65	\$20.77	\$0.00	\$74.27	
	8	90	\$50.45	\$8.65	\$21.91	\$0.00	\$81.01	
		ive Date - 07/01/2023	A C D W	II 1d	ъ.	Supplemental	T (1 D (
	Step	percent	Apprentice Base Wage		Pension	Unemployment	Total Rate	
	1	50	\$28.63	\$8.65	\$0.00	\$0.00	\$37.28	
	2	55	\$31.49	\$8.65	\$6.27	\$0.00	\$46.41	
	3	60	\$34.36	\$8.65	\$6.84	\$0.00	\$49.85	
	4	65	\$37.22	\$8.65	\$7.41	\$0.00	\$53.28	
	5	70	\$40.08	\$8.65	\$19.63	\$0.00	\$68.36	
	6	75	\$42.95	\$8.65	\$20.20	\$0.00	\$71.80	
	7	80	\$45.81	\$8.65	\$20.77	\$0.00	\$75.23	
	8	90	\$51.53	\$8.65	\$21.91	\$0.00	\$82.09	
	Notes:							
	İ	Steps are 750 hrs.						
	Appre	ntice to Journeyworker Ratio:1:	1					
		SANDBLAST, NEW) * rfaces to be painted are new const	01/01/2023	3 \$46.96	\$8.65	\$23.05	\$0.00	\$78.66
		cused. <i>PAINTERS LOCAL 35 - ZONE 2</i>	07/01/2023	\$48.16	\$8.65	\$23.05	\$0.00	\$79.86
1			01/01/2024	\$49.36	\$8.65	\$23.05	\$0.00	\$81.06
			07/01/2024	\$50.56	\$8.65	\$23.05	\$0.00	\$82.26
			01/01/2025	\$51.76	\$8.65	\$23.05	\$0.00	\$83.46

Effective Date Base Wage Health

Classification

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Supplemental

Unemployment

Pension

Total Rate

Issue Date: 05/26/2023 **Wage Request Number:** 20230526-010 **Page 25 of 41**

Effective Date Base Wage Health

Pension

Total Rate

Step	ive Date - 01/01/2023 percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
1	50	\$23.48	\$8.65	\$0.00	\$0.00	\$32.13	
2	55	\$25.83	\$8.65	\$6.27	\$0.00	\$40.75	
3	60	\$28.18	\$8.65	\$6.84	\$0.00	\$43.67	
4	65	\$30.52	\$8.65	\$7.41	\$0.00	\$46.58	
5	70	\$32.87	\$8.65	\$19.63	\$0.00	\$61.15	
6	75	\$35.22	\$8.65	\$20.20	\$0.00	\$64.07	
7	80	\$37.57	\$8.65	\$20.77	\$0.00	\$66.99	
8	90	\$42.26	\$8.65	\$21.91	\$0.00	\$72.82	
Effecti Step	ive Date - 07/01/2023 percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
1	50	\$24.08	\$8.65	\$0.00	\$0.00	\$32.73	
2	55	\$26.49	\$8.65	\$6.27	\$0.00	\$41.41	
3	60	\$28.90	\$8.65	\$6.84	\$0.00	\$44.39	
4	65	\$31.30	\$8.65	\$7.41	\$0.00	\$47.36	
5	70	\$33.71	\$8.65	\$19.63	\$0.00	\$61.99	
6	75	\$36.12	\$8.65	\$20.20	\$0.00	\$64.97	
7	80	\$38.53	\$8.65	\$20.77	\$0.00	\$67.95	
8	90	\$43.34	\$8.65	\$21.91	\$0.00	\$73.90	
Notes:	Steps are 750 hrs.						
Appre	ntice to Journeyworker Ratio:1						
*	SANDBLAST, REPAINT)	01/01/2023	\$45.02	\$8.65	\$23.05	\$0.00	\$76.
S LOCAL 35 - ZONI	5 Z	07/01/2023	\$46.22	\$8.65	\$23.05	\$0.00	\$77.
		01/01/2024	\$47.42	\$8.65	\$23.05	\$0.00	\$79.
		07/01/2024	\$48.62	\$8.65	\$23.05	\$0.00	\$80.

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Pension

Total Rate

Step	percent 01/01/2023	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
1	50	\$22.51	\$8.65	\$0.00	\$0.00	\$31.16	
2	55	\$24.76	\$8.65	\$6.27	\$0.00	\$39.68	
3	60	\$27.01	\$8.65	\$6.84	\$0.00	\$42.50	
4	65	\$29.26	\$8.65	\$7.41	\$0.00	\$45.32	
5	70	\$31.51	\$8.65	\$19.63	\$0.00	\$59.79	
6	75	\$33.77	\$8.65	\$20.20	\$0.00	\$62.62	
7	80	\$36.02	\$8.65	\$20.77	\$0.00	\$65.44	
8	90	\$40.52	\$8.65	\$21.91	\$0.00	\$71.08	
Effe.	percent 07/01/2023	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
1	50	\$23.11	\$8.65	\$0.00	\$0.00	\$31.76	
2	55	\$25.42	\$8.65	\$6.27	\$0.00	\$40.34	
3	60	\$27.73	\$8.65	\$6.84	\$0.00	\$43.22	
4	65	\$30.04	\$8.65	\$19.06	\$0.00	\$57.75	
5	70	\$32.35	\$8.65	\$19.63	\$0.00	\$60.63	
6	75	\$34.67	\$8.65	\$20.20	\$0.00	\$63.52	
7	80	\$36.98	\$8.65	\$20.77	\$0.00	\$66.40	
8	90	\$41.60	\$8.65	\$21.91	\$0.00	\$72.16	
Note	Steps are 750 hrs.						
App	rentice to Journeyworker Ratio	 p:1:1					
	BRUSH, NEW) *	01/01/2023	\$45.56	\$8.65	\$23.05	\$0.00	\$77.
	urfaces to be painted are new cor	nstruction, 07/01/2023		\$8.65	\$23.05	\$0.00	\$78.
int rate shall	be used.PAINTERS LOCAL 35 - ZONE	01/01/2024		\$8.65	\$23.05	\$0.00	\$79.
		07/01/2024		\$8.65	\$23.05	\$0.00	\$80.
		01/01/2025		\$8.65	\$23.05	\$0.00	\$8

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Total Rate

Pension

Unemployment

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
1	50	\$22.78	\$8.65	\$0.00	\$0.00	\$31.43	
2	55	\$25.06	\$8.65	\$6.27	\$0.00	\$39.98	
3	60	\$27.34	\$8.65	\$6.84	\$0.00	\$42.83	
4	65	\$29.61	\$8.65	\$7.41	\$0.00	\$45.67	
5	70	\$31.89	\$8.65	\$19.63	\$0.00	\$60.17	
6	75	\$34.17	\$8.65	\$20.20	\$0.00	\$63.02	
7	80	\$36.45	\$8.65	\$20.77	\$0.00	\$65.87	
8	90	\$41.00	\$8.65	\$21.91	\$0.00	\$71.56	
Effect	ive Date - 07/01/2023				Supplemental		
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50	\$23.38	\$8.65	\$0.00	\$0.00	\$32.03	
2	55	\$25.72	\$8.65	\$6.27	\$0.00	\$40.64	
3	60	\$28.06	\$8.65	\$6.84	\$0.00	\$43.55	
4	65	\$30.39	\$8.65	\$7.41	\$0.00	\$46.45	
5	70	\$32.73	\$8.65	\$19.63	\$0.00	\$61.01	
6	75	\$35.07	\$8.65	\$20.20	\$0.00	\$63.92	
7	80	\$37.41	\$8.65	\$20.77	\$0.00	\$66.83	
8	90	\$42.08	\$8.65	\$21.91	\$0.00	\$72.64	
Notes	<u> </u>						
İ	Steps are 750 hrs.					i	
Appro	entice to Journeyworker Ratio	:1:1					
	RUSH, REPAINT)	01/01/2023	\$43.62	\$8.65	\$23.05	\$0.00	\$75.3
OCAL 35 - ZON	E 2	07/01/2023	\$44.82	\$8.65	\$23.05	\$0.00	\$76.5
		01/01/2024	\$46.02	\$8.65	\$23.05	\$0.00	\$77.7
		07/01/2024	\$47.22	\$8.65	\$23.05	\$0.00	\$78.9

01/01/2025

\$48.42

\$8.65

\$23.05

\$0.00

\$80.12

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Pension

Total Rate

	Step	ive Date - 01/01/2023 percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
	1	50	\$21.81	\$8.65	\$0.00	\$0.00	\$30.46	
	2	55	\$23.99	\$8.65	\$6.27	\$0.00	\$38.91	
	3	60	\$26.17	\$8.65	\$6.84	\$0.00	\$41.66	
	4	65	\$28.35	\$8.65	\$7.41	\$0.00	\$44.41	
	5	70	\$30.53	\$8.65	\$19.63	\$0.00	\$58.81	
	6	75	\$32.72	\$8.65	\$20.20	\$0.00	\$61.57	
	7	80	\$34.90	\$8.65	\$20.77	\$0.00	\$64.32	
	8	90	\$39.26	\$8.65	\$21.91	\$0.00	\$69.82	
	Effect	ive Date - 07/01/2023				Supplemental		
	Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50	\$22.41	\$8.65	\$0.00	\$0.00	\$31.06	
	2	55	\$24.65	\$8.65	\$6.27	\$0.00	\$39.57	
	3	60	\$26.89	\$8.65	\$6.84	\$0.00	\$42.38	
	4	65	\$29.13	\$8.65	\$7.41	\$0.00	\$45.19	
	5	70	\$31.37	\$8.65	\$19.63	\$0.00	\$59.65	
	6	75	\$33.62	\$8.65	\$20.20	\$0.00	\$62.47	
	7	80	\$35.86	\$8.65	\$20.77	\$0.00	\$65.28	
	8	90	\$40.34	\$8.65	\$21.91	\$0.00	\$70.90	
	Notes:	Steps are 750 hrs.					 	
	Appre	entice to Journeyworker Ratio:1:1						
		IARKINGS (HEAVY/HIGHWAY)	12/01/2022	2 \$42.58	\$9.35	\$17.82	\$0.00	\$69.7
KEKS - ZONE	t I (HEAV	Y & HIGHWAY)	06/01/2023	\$43.58	\$9.40	\$17.82	\$0.00	\$70.8
			12/01/2023	\$44.83	\$9.40	\$17.82	\$0.00	\$72.0
			06/01/2024	\$46.31	\$9.40	\$17.82	\$0.00	\$73.5
			12/01/2024	\$47.78	\$9.40	\$17.82	\$0.00	\$75.0
			06/01/2025	\$49.28	\$9.40	\$17.82	\$0.00	\$76.5
			12/01/2025	\$50.78	\$9.40	\$17.82	\$0.00	\$78.0
			06/01/2026	\$52.33	\$9.40	\$17.82	\$0.00	\$79.5
-		III da Farancia de	12/01/2020	\$53.83	\$9.40	\$17.82	\$0.00	\$81.0
		"Apprentice- LABORER (Heavy and Highway	-					
		UCKS DRIVER IL NO. 10 ZONE A	12/01/2021	\$36.88	\$13.41	\$16.01	\$0.00	\$66.3
K) RIVER LOC	'AL 56 (ZC	NSTRUCTOR (UNDERPINNING A ONE 1) "Apprentice- PILE DRIVER"	ND 08/01/2020	\$49.07	\$9.40	\$23.12	\$0.00	\$81.5
DRIVER	'AL 56 (ZC		08/01/2020	\$49.07	\$9.40	\$23.12	\$0.00	\$81.5

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Total Rate

Apprentice - PILE DRIVER - Local 56 Zone 1

Apprentice to Journeyworker Ratio:**

08/01/2020

Effective Date -

Supplemental

	iive Date - 08/01/2020			_	Supplemental		
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50	\$24.54	\$9.40	\$23.12	\$0.00	\$57.06	
2	60	\$29.44	\$9.40	\$23.12	\$0.00	\$61.96	
3	70	\$34.35	\$9.40	\$23.12	\$0.00	\$66.87	
4	75	\$36.80	\$9.40	\$23.12	\$0.00	\$69.32	
5	80	\$39.26	\$9.40	\$23.12	\$0.00	\$71.78	
6	80	\$39.26	\$9.40	\$23.12	\$0.00	\$71.78	
7	90	\$44.16	\$9.40	\$23.12	\$0.00	\$76.68	
8	90	\$44.16	\$9.40	\$23.12	\$0.00	\$76.68	
Notes	:						
	% Indentured After 10/1/17; 45/45. Step 1&2 \$34.01/ 3&4 \$41.46/ 5&						
Appr	entice to Journeyworker Ratio:1:5						
EFITTER & STEA	MFITTER	03/01/2023	\$63.43	\$12.25	\$20.80	\$0.00	\$96.48
EFITTERS LOCAL 537		09/01/2023		\$12.25	\$20.80	\$0.00	\$98.23
		03/01/2024		\$12.25	\$20.80	\$0.00	\$100.03
				\$12.25	\$20.80	\$0.00	\$101.83
		09/01/2024					
	entice - PIPEFITTER - Local 537	09/01/2024 03/01/2025		\$12.25	\$20.80	\$0.00	\$103.63
Effec	tive Date - 03/01/2023	03/01/2025	5 \$70.58	\$12.25	\$20.80 Supplemental Unemployment		\$103.63
	tive Date - 03/01/2023 percent	03/01/2025 Apprentice Base Wage	5 \$70.58 Health	\$12.25 Pension	Supplemental Unemployment	Total Rate	\$103.63
Effec Step	tive Date - 03/01/2023 percent 40	Apprentice Base Wage \$25.37	Health \$12.25	\$12.25 Pension \$8.55	Supplemental Unemployment \$0.00	Total Rate \$46.17	\$103.63
Effec Step	tive Date - 03/01/2023 percent	03/01/2025 Apprentice Base Wage \$25.37 \$28.54	Health \$12.25 \$12.25	\$12.25 Pension \$8.55 \$20.80	Supplemental Unemployment \$0.00 \$0.00	Total Rate \$46.17 \$61.59	\$103.63
Effec Step 1 2	tive Date - 03/01/2023 percent 40 45	03/01/2025 Apprentice Base Wage \$25.37 \$28.54 \$38.06	Health \$12.25 \$12.25 \$12.25	\$12.25 Pension \$8.55 \$20.80 \$20.80	Supplemental Unemployment \$0.00 \$0.00 \$0.00	Total Rate \$46.17 \$61.59 \$71.11	\$103.60
Effec Step 1 2 3	tive Date - 03/01/2023 percent 40 45 60	03/01/2025 Apprentice Base Wage \$25.37 \$28.54	Health \$12.25 \$12.25	\$12.25 Pension \$8.55 \$20.80	Supplemental Unemployment \$0.00 \$0.00	Total Rate \$46.17 \$61.59	\$103.63
Effec Step 1 2 3 4 5	tive Date - 03/01/2023 percent 40 45 60 70	03/01/2025 Apprentice Base Wage \$25.37 \$28.54 \$38.06 \$44.40	Health \$12.25 \$12.25 \$12.25 \$12.25	\$12.25 Pension \$8.55 \$20.80 \$20.80 \$20.80	Supplemental Unemployment \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	Total Rate \$46.17 \$61.59 \$71.11 \$77.45	\$103.60
Effec Step 1 2 3 4 5	tive Date - 03/01/2023 percent 40 45 60 70 80	03/01/2025 Apprentice Base Wage \$25.37 \$28.54 \$38.06 \$44.40	Health \$12.25 \$12.25 \$12.25 \$12.25 \$12.25	\$12.25 Pension \$8.55 \$20.80 \$20.80 \$20.80	Supplemental Unemployment \$0.00 \$0.00 \$0.00 \$0.00	Total Rate \$46.17 \$61.59 \$71.11 \$77.45	\$103.60
Effec Step 1 2 3 4 5	tive Date - 03/01/2023 percent 40 45 60 70 80 tive Date - 09/01/2023	03/01/2025 Apprentice Base Wage \$25.37 \$28.54 \$38.06 \$44.40 \$50.74	Health \$12.25 \$12.25 \$12.25 \$12.25 \$12.25	\$12.25 Pension \$8.55 \$20.80 \$20.80 \$20.80 \$20.80	Supplemental Unemployment \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	Total Rate \$46.17 \$61.59 \$71.11 \$77.45 \$83.79	\$103.60
Step 1 2 3 4 5 Effec Step	tive Date - 03/01/2023 percent 40 45 60 70 80 tive Date - 09/01/2023 percent	03/01/2025 Apprentice Base Wage \$25.37 \$28.54 \$38.06 \$44.40 \$50.74 Apprentice Base Wage	Health \$12.25 \$12.25 \$12.25 \$12.25 Health	\$12.25 Pension \$8.55 \$20.80 \$20.80 \$20.80 Pension	Supplemental Unemployment \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 Supplemental Unemployment	Total Rate \$46.17 \$61.59 \$71.11 \$77.45 \$83.79	\$103.60
Effec Step 1 2 3 4 5 Effec Step 1	tive Date - 03/01/2023 percent 40 45 60 70 80 tive Date - 09/01/2023 percent 40	03/01/2025 Apprentice Base Wage \$25.37 \$28.54 \$38.06 \$44.40 \$50.74 Apprentice Base Wage \$26.07	Health \$12.25 \$12.25 \$12.25 \$12.25 \$12.25 Health \$12.25	\$12.25 Pension \$8.55 \$20.80 \$20.80 \$20.80 Pension \$8.55	Supplemental Unemployment \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 Supplemental Unemployment	Total Rate \$46.17 \$61.59 \$71.11 \$77.45 \$83.79 Total Rate \$46.87	\$103.60
Effec Step 1 2 3 4 5 Effec Step 1 2 2 3 4 5	tive Date - 03/01/2023 percent 40 45 60 70 80 tive Date - 09/01/2023 percent 40 45	03/01/2025 Apprentice Base Wage \$25.37 \$28.54 \$38.06 \$44.40 \$50.74 Apprentice Base Wage \$26.07 \$29.33 \$39.11	Health \$12.25 \$12.25 \$12.25 \$12.25 Health \$12.25 \$12.25	\$12.25 Pension \$8.55 \$20.80 \$20.80 \$20.80 Pension \$8.55 \$20.80 \$20.80	Supplemental Unemployment \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	Total Rate \$46.17 \$61.59 \$71.11 \$77.45 \$83.79 Total Rate \$46.87 \$62.38 \$72.16	\$103.60
Effec Step 1 2 3 4 5 Effec Step 1 2 3 3 4 5	tive Date - 03/01/2023 percent 40 45 60 70 80 tive Date - 09/01/2023 percent 40 45 60	03/01/2025 Apprentice Base Wage \$25.37 \$28.54 \$38.06 \$44.40 \$50.74 Apprentice Base Wage \$26.07 \$29.33	Health \$12.25 \$12.25 \$12.25 \$12.25 \$12.25 \$12.25 \$12.25	\$12.25 Pension \$8.55 \$20.80 \$20.80 \$20.80 Pension \$8.55 \$20.80	Supplemental Unemployment \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 Supplemental Unemployment \$0.00 \$0.00	Total Rate \$46.17 \$61.59 \$71.11 \$77.45 \$83.79 Total Rate \$46.87 \$62.38	\$103.60
Effec Step 1 2 3 4 5 Effec Step 1 2 3 4 5 4 5 A 4 4 4 4 5 Effec Step 1 2 3 4	tive Date - 03/01/2023 percent 40 45 60 70 80 tive Date - 09/01/2023 percent 40 45 60 70 80 70 80	03/01/2025 Apprentice Base Wage \$25.37 \$28.54 \$38.06 \$44.40 \$50.74 Apprentice Base Wage \$26.07 \$29.33 \$39.11 \$45.63	Health \$12.25 \$12.25 \$12.25 \$12.25 \$12.25 \$12.25 \$12.25 \$12.25 \$12.25 \$12.25	\$12.25 Pension \$8.55 \$20.80 \$20.80 \$20.80 Pension \$8.55 \$20.80 \$20.80 \$20.80	Supplemental Unemployment \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 Supplemental Unemployment \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	Total Rate \$46.17 \$61.59 \$71.11 \$77.45 \$83.79 Total Rate \$46.87 \$62.38 \$72.16 \$78.68	\$103.60

			Effective	Date	Base Wage	Health		Supplemental Unemployment	Total Rat
PIPELAYER			12/01/2	2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
LABORERS - ZONE	E I		06/01/2	2023	\$43.83	\$9.40	\$17.82	\$0.00	\$71.05
For apprentice	rates see	"Apprentice- LABORER"	12/01/2	2023	\$45.08	\$9.40	\$17.82	\$0.00	\$72.30
		& HIGHWAY)	12/01/2	2022	\$42.83	\$9.35	\$17.82	\$0.00	\$70.00
LABORERS - ZONE	E 1 (HEAV	Y & HIGHWAY)	06/01/2		\$43.83	\$9.40	\$17.82	\$0.00	\$71.05
			12/01/2		\$45.08	\$9.40	\$17.82	\$0.00	\$72.30
			06/01/2		\$46.56	\$9.40	\$17.82	\$0.00	\$73.78
			12/01/2		\$48.03	\$9.40	\$17.82	\$0.00	\$75.25
			06/01/2		\$49.53	\$9.40	\$17.82	\$0.00	\$76.75
			12/01/2		\$51.03	\$9.40	\$17.82	\$0.00	\$78.25
			06/01/2		\$52.58	\$9.40	\$17.82	\$0.00	\$79.80
			12/01/2				\$17.82	\$0.00	\$81.30
For apprentice	e rates see '	"Apprentice- LABORER (Heavy and High		.020	\$54.08	\$9.40	\$17.02	\$0.00	\$61.30
PLUMBERS &			02/26/2	2023	\$64.69	\$14.07	\$18.86	\$0.00	\$97.62
PLUMBERS & GAS	SFITTERS	LOCAL 12	09/03/2	2023	\$66.44	\$14.07	\$18.86	\$0.00	\$99.37
			03/03/2	2024	\$68.24	\$14.07	\$18.86	\$0.00	\$101.17
			09/01/2	2024	\$70.04	\$14.07	\$18.86	\$0.00	\$102.97
			03/02/2	2025	\$71.84	\$14.07	\$18.86	\$0.00	\$104.77
	Effecti		- Local 12				Sunnlamantal		
	Effect: Step		Apprentice Base Wa	ge He	alth	Pension	Supplemental		
		ive Date - 02/26/2023			alth 4.07	Pension \$6.80		Total Rate	
	Step	ove Date - 02/26/2023 percent	Apprentice Base Wa	\$14			Unemployment	Total Rate \$43.51	
	Step 1	percent 02/26/2023 parcent 35	Apprentice Base Wa \$22.64	\$14 \$14	4.07	\$6.80	Unemployment \$0.00	Total Rate \$43.51 \$47.67	
	Step 1 2	percent 35 40	Apprentice Base Wa \$22.64 \$25.88	\$14 \$14 \$14	4.07 4.07	\$6.80 \$7.72	\$0.00 \$0.00	Total Rate \$43.51 \$47.67 \$60.16	
	Step 1 2 3	percent 35 40 55	Apprentice Base Wa \$22.64 \$25.88 \$35.58	\$14 \$14 \$14 \$14	4.07 4.07 4.07	\$6.80 \$7.72 \$10.51	\$0.00 \$0.00 \$0.00	Total Rate \$43.51 \$47.67 \$60.16 \$68.48	
	Step 1 2 3 4 5	92/26/2023 percent 35 40 55 65	\$22.64 \$25.88 \$35.58 \$42.05	\$14 \$14 \$14 \$14	4.07 4.07 4.07 4.07	\$6.80 \$7.72 \$10.51 \$12.36	\$0.00 \$0.00 \$0.00 \$0.00	Total Rate \$43.51 \$47.67 \$60.16 \$68.48 \$76.81	
	Step 1 2 3 4 5	percent 35 40 55 65 75	\$22.64 \$25.88 \$35.58 \$42.05	\$14 \$12 \$14 \$14 \$14	4.07 4.07 4.07 4.07 4.07	\$6.80 \$7.72 \$10.51 \$12.36	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00	Total Rate \$43.51 \$47.67 \$60.16 \$68.48 \$76.81	
	Step 1 2 3 4 5 Effective Step 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	92/26/2023 percent 35 40 55 65 75 ive Date - 09/03/2023	\$22.64 \$25.88 \$35.58 \$42.05 \$48.52	\$14 \$14 \$14 \$14 \$14	4.07 4.07 4.07 4.07 4.07	\$6.80 \$7.72 \$10.51 \$12.36 \$14.22	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00	Total Rate \$43.51 \$47.67 \$60.16 \$68.48 \$76.81 Total Rate	
	Step 1 2 3 4 5 Effecti	percent 35 40 55 65 75 ive Date - 09/03/2023 percent	\$22.64 \$25.88 \$35.58 \$42.05 \$48.52	\$14 \$14 \$12 \$14 \$14 \$14	4.07 4.07 4.07 4.07 4.07	\$6.80 \$7.72 \$10.51 \$12.36 \$14.22	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 Supplemental Unemployment	Total Rate \$43.51 \$47.67 \$60.16 \$68.48 \$76.81 Total Rate \$44.12	
	Step	92/26/2023 percent 35 40 55 65 75 ive Date - 09/03/2023 percent 35	\$22.64 \$25.88 \$35.58 \$42.05 \$48.52 Apprentice Base Wa	\$12 \$12 \$12 \$14 \$14 \$14 \$14 \$12	4.07 4.07 4.07 4.07 4.07	\$6.80 \$7.72 \$10.51 \$12.36 \$14.22 Pension \$6.80	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 Supplemental Unemployment	Total Rate \$43.51 \$47.67 \$60.16 \$68.48 \$76.81 Total Rate \$44.12 \$48.37	
	Step 1 2 3 4 5	902/26/2023 percent 35 40 55 65 75 ive Date - 09/03/2023 percent 35 40	Apprentice Base Wa \$22.64 \$25.88 \$35.58 \$42.05 \$48.52 Apprentice Base Wa \$23.25 \$26.58	\$14 \$14 \$14 \$14 \$14 \$14 \$14 \$14 \$14	4.07 4.07 4.07 4.07 4.07 4.07	\$6.80 \$7.72 \$10.51 \$12.36 \$14.22 Pension \$6.80 \$7.72	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	Total Rate \$43.51 \$47.67 \$60.16 \$68.48 \$76.81 Total Rate \$44.12 \$48.37 \$61.12	
	Step 1 2 3 4 5 Effecti Step 1 2 3	percent 35 40 55 65 75 ive Date - 09/03/2023 percent 35 40 55 55 55	Apprentice Base Wa \$22.64 \$25.88 \$35.58 \$42.05 \$48.52 Apprentice Base Wa \$23.25 \$26.58 \$36.54	\$12 \$12 \$12 \$12 \$14 \$14 \$14 \$14 \$14 \$14	4.07 4.07 4.07 4.07 4.07 4.07 4.07	\$6.80 \$7.72 \$10.51 \$12.36 \$14.22 Pension \$6.80 \$7.72 \$10.51	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	Total Rate \$43.51 \$47.67 \$60.16 \$68.48 \$76.81 Total Rate \$44.12 \$48.37 \$61.12 \$69.62	
	Step 1 2 3 4 5 Effecti Step 1 2 3 4 5	ive Date - 02/26/2023 percent 35 40 55 65 75 ive Date - 09/03/2023 percent 35 40 55 65 75	Apprentice Base Wa \$22.64 \$25.88 \$35.58 \$42.05 \$48.52 Apprentice Base Wa \$23.25 \$26.58 \$36.54 \$43.19	\$12 \$12 \$12 \$12 \$14 \$14 \$14 \$14 \$14 \$14	4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07	\$6.80 \$7.72 \$10.51 \$12.36 \$14.22 Pension \$6.80 \$7.72 \$10.51 \$12.36	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	Total Rate \$43.51 \$47.67 \$60.16 \$68.48 \$76.81 Total Rate \$44.12 \$48.37 \$61.12 \$69.62	
	Step 1 2 3 4 5 Effecti Step 1 2 3 4	ive Date - 02/26/2023 percent 35 40 55 65 75 ive Date - 09/03/2023 percent 35 40 55 65 75	Apprentice Base Wa \$22.64 \$25.88 \$35.58 \$42.05 \$48.52 Apprentice Base Wa \$23.25 \$26.58 \$36.54 \$43.19 \$49.83 ps are 1 yr	\$12 \$12 \$12 \$12 \$14 \$14 \$14 \$14 \$14 \$14	4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07	\$6.80 \$7.72 \$10.51 \$12.36 \$14.22 Pension \$6.80 \$7.72 \$10.51 \$12.36	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	Total Rate \$43.51 \$47.67 \$60.16 \$68.48 \$76.81 Total Rate \$44.12 \$48.37 \$61.12 \$69.62	
	Step 1 2 3 4 5	percent 35 40 55 65 75 ive Date - 09/03/2023 percent 35 40 55 65 75 ** 1:2; 2:6; 3:10; 4:14; 5:19/Ste	Apprentice Base Wa \$22.64 \$25.88 \$35.58 \$42.05 \$48.52 Apprentice Base Wa \$23.25 \$26.58 \$36.54 \$43.19 \$49.83 ps are 1 yr n lic\$76.87	\$12 \$12 \$12 \$12 \$14 \$14 \$14 \$14 \$14 \$14	4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07	\$6.80 \$7.72 \$10.51 \$12.36 \$14.22 Pension \$6.80 \$7.72 \$10.51 \$12.36	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	Total Rate \$43.51 \$47.67 \$60.16 \$68.48 \$76.81 Total Rate \$44.12 \$48.37 \$61.12 \$69.62	
PNEUMATIC (Step 1 2 3 4 5	percent 35 40 55 65 75 ive Date - 09/03/2023 percent 35 40 55 65 75 ** 1:2; 2:6; 3:10; 4:14; 5:19/Ste Step4 with lic\$69.00, Step5 with intice to Journeyworker Ratio:**	Apprentice Base Wa \$22.64 \$25.88 \$35.58 \$42.05 \$48.52 Apprentice Base Wa \$23.25 \$26.58 \$36.54 \$43.19 \$49.83 ps are 1 yr n lic\$76.87	\$12 \$12 \$12 \$12 \$14 \$14 \$14 \$14 \$14	4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07	\$6.80 \$7.72 \$10.51 \$12.36 \$14.22 Pension \$6.80 \$7.72 \$10.51 \$12.36 \$14.22	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	Total Rate \$43.51 \$47.67 \$60.16 \$68.48 \$76.81 Total Rate \$44.12 \$48.37 \$61.12 \$69.62	
	Step 1 2 3 4 5	percent 35 40 55 65 75 ive Date - 09/03/2023 percent 35 40 55 65 75 ** 1:2; 2:6; 3:10; 4:14; 5:19/Ste Step4 with lic\$69.00, Step5 with intice to Journeyworker Ratio:**	Apprentice Base Wa \$22.64 \$25.88 \$35.58 \$42.05 \$48.52 Apprentice Base Wa \$23.25 \$26.58 \$36.54 \$43.19 \$49.83 ps are 1 yr n lic\$76.87 03/01/2	\$12 \$12 \$12 \$12 \$12 \$12 \$12 \$12 \$12 \$12	4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07	\$6.80 \$7.72 \$10.51 \$12.36 \$14.22 Pension \$6.80 \$7.72 \$10.51 \$12.36 \$14.22	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	Total Rate \$43.51 \$47.67 \$60.16 \$68.48 \$76.81 Total Rate \$44.12 \$48.37 \$61.12 \$69.62 \$78.12	\$96.23
	Step 1 2 3 4 5	percent 35 40 55 65 75 ive Date - 09/03/2023 percent 35 40 55 65 75 ** 1:2; 2:6; 3:10; 4:14; 5:19/Ste Step4 with lic\$69.00, Step5 with intice to Journeyworker Ratio:**	Apprentice Base Wa \$22.64 \$25.88 \$35.58 \$42.05 \$48.52 Apprentice Base Wa \$23.25 \$26.58 \$36.54 \$43.19 \$49.83 ps are 1 yr n lic\$76.87 03/01/2 09/01/2	\$14 \$14 \$14 \$14 \$14 \$14 \$14 \$14 \$14 \$14	4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07	\$6.80 \$7.72 \$10.51 \$12.36 \$14.22 Pension \$6.80 \$7.72 \$10.51 \$12.36 \$14.22	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.80 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	Total Rate \$43.51 \$47.67 \$60.16 \$68.48 \$76.81 Total Rate \$44.12 \$48.37 \$61.12 \$69.62 \$78.12 \$0.00 \$0.00	\$96.23 \$97.98
PNEUMATIC (Step 1 2 3 4 5	percent 35 40 55 65 75 ive Date - 09/03/2023 percent 35 40 55 65 75 ** 1:2; 2:6; 3:10; 4:14; 5:19/Ste Step4 with lic\$69.00, Step5 with intice to Journeyworker Ratio:**	Apprentice Base Wa \$22.64 \$25.88 \$35.58 \$42.05 \$48.52 Apprentice Base Wa \$23.25 \$26.58 \$36.54 \$43.19 \$49.83 ps are 1 yr n lic\$76.87 03/01/2	\$14 \$14 \$12 \$12 \$14 \$14 \$14 \$14 \$14 \$14 \$14 \$14 \$14 \$14	4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07 4.07	\$6.80 \$7.72 \$10.51 \$12.36 \$14.22 Pension \$6.80 \$7.72 \$10.51 \$12.36 \$14.22	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	Total Rate \$43.51 \$47.67 \$60.16 \$68.48 \$76.81 Total Rate \$44.12 \$48.37 \$61.12 \$69.62 \$78.12	\$96.23

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Classification For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PNEUMATIC DRILL/TOOL OPERATOR	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
LABORERS - ZONE I	06/01/2023	\$43.83	\$9.40	\$17.82	\$0.00	\$71.05
	12/01/2023	\$45.08	\$9.40	\$17.82	\$0.00	\$72.30
For apprentice rates see "Apprentice- LABORER"						
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY &	12/01/2022	\$42.83	\$9.35	\$17.82	\$0.00	\$70.00
HIGHWAY) LABORERS - ZONE 1 (HEAVY & HIGHWAY)	06/01/2023	\$43.83	\$9.40	\$17.82	\$0.00	\$71.05
,	12/01/2023	\$45.08	\$9.40	\$17.82	\$0.00	\$72.30
	06/01/2024	\$46.56	\$9.40	\$17.82	\$0.00	\$73.78
	12/01/2024	\$48.03	\$9.40	\$17.82	\$0.00	\$75.25
	06/01/2025	\$49.53	\$9.40	\$17.82	\$0.00	\$76.75
	12/01/2025	\$51.03	\$9.40	\$17.82	\$0.00	\$78.25
	06/01/2026	\$52.58	\$9.40	\$17.82	\$0.00	\$79.80
	12/01/2026	\$54.08	\$9.40	\$17.82	\$0.00	\$81.30
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
POWDERMAN & BLASTER LABORERS - ZONE I	12/01/2022	\$44.18	\$9.10	\$17.57	\$0.00	\$70.85
	06/01/2023	\$44.58	\$9.40	\$17.82	\$0.00	\$71.80
B	12/01/2023	\$45.83	\$9.40	\$17.82	\$0.00	\$73.05
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER (HEAVY & HIGHWAY) LABORERS - ZONE 1 (HEAVY & HIGHWAY)	12/01/2022	\$43.58	\$9.35	\$17.82	\$0.00	\$70.75
,	06/01/2023	\$44.58	\$9.40	\$17.82	\$0.00	\$71.80
	12/01/2023	\$45.83	\$9.40	\$17.82	\$0.00	\$73.05
	06/01/2024	\$47.31	\$9.40	\$17.82	\$0.00	\$74.53
	12/01/2024	\$48.78	\$9.40	\$17.82	\$0.00	\$76.00
	06/01/2025	\$50.28	\$9.40	\$17.82	\$0.00	\$77.50
	12/01/2025	\$51.78	\$9.40	\$17.82	\$0.00	\$79.00
	06/01/2026	\$53.33	\$9.40	\$17.82	\$0.00	\$80.55
F	12/01/2026	\$54.83	\$9.40	\$17.82	\$0.00	\$82.05
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
POWER SHOVEL/DERRICK/TRENCHING MACHINE OPERATING ENGINEERS LOCAL 4	12/01/2022	\$53.63	\$14.25	\$16.05	\$0.00	\$83.93
	06/01/2023	\$54.88	\$14.25	\$16.05	\$0.00	\$85.18
	12/01/2023	\$56.13	\$14.25	\$16.05	\$0.00	\$86.43
	06/01/2024	\$57.43	\$14.25	\$16.05	\$0.00	\$87.73
	12/01/2024	\$58.88	\$14.25	\$16.05	\$0.00	\$89.18
	06/01/2025	\$60.18	\$14.25	\$16.05	\$0.00	\$90.48
	12/01/2025	\$61.63	\$14.25	\$16.05	\$0.00	\$91.93
	06/01/2026	\$62.93	\$14.25	\$16.05	\$0.00	\$93.23
For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2026	\$64.38	\$14.25	\$16.05	\$0.00	\$94.68

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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PUMP OPERATOR (CONCRETE) OPERATING ENGINEERS LOCAL 4	12/01/2022	\$53.63	\$14.25	\$16.05	\$0.00	\$83.93
OFERATING ENGINEERS LOCAL 4	06/01/2023	\$54.88	\$14.25	\$16.05	\$0.00	\$85.18
	12/01/2023	\$56.13	\$14.25	\$16.05	\$0.00	\$86.43
	06/01/2024	\$57.43	\$14.25	\$16.05	\$0.00	\$87.73
	12/01/2024	\$58.88	\$14.25	\$16.05	\$0.00	\$89.18
	06/01/2025	\$60.18	\$14.25	\$16.05	\$0.00	\$90.48
	12/01/2025	\$61.63	\$14.25	\$16.05	\$0.00	\$91.93
	06/01/2026	\$62.93	\$14.25	\$16.05	\$0.00	\$93.23
	12/01/2026	\$64.38	\$14.25	\$16.05	\$0.00	\$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) OPERATING ENGINEERS LOCAL 4	12/01/2022	\$35.08	\$14.25	\$16.05	\$0.00	\$65.38
OI EMITING ENGINEERS ECCIL 7	06/01/2023	\$35.90	\$14.25	\$16.05	\$0.00	\$66.20
	12/01/2023	\$36.72	\$14.25	\$16.05	\$0.00	\$67.02
	06/01/2024	\$37.57	\$14.25	\$16.05	\$0.00	\$67.87
	12/01/2024	\$38.52	\$14.25	\$16.05	\$0.00	\$68.82
	06/01/2025	\$39.37	\$14.25	\$16.05	\$0.00	\$69.67
	12/01/2025	\$40.32	\$14.25	\$16.05	\$0.00	\$70.62
	06/01/2026	\$41.18	\$14.25	\$16.05	\$0.00	\$71.48
	12/01/2026	\$42.13	\$14.25	\$16.05	\$0.00	\$72.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY MIX CONCRETE DRIVERS after 4/30/12 (Drivers Hired After 4/30/2012) TEAMSTERS 25 (Metro) - Aggregate	08/01/2022	\$30.40	\$11.91	\$15.25	\$0.00	\$57.56
READY-MIX CONCRETE DRIVER TEAMSTERS 25 (Metro) - Aggregate	08/01/2022	\$34.41	\$11.91	\$15.25	\$0.00	\$61.57
RECLAIMERS	12/01/2022	\$53.05	\$14.25	\$16.05	\$0.00	\$83.35
OPERATING ENGINEERS LOCAL 4	06/01/2023	\$54.29	\$14.25	\$16.05	\$0.00	\$84.59
	12/01/2023	\$55.53	\$14.25	\$16.05	\$0.00	\$85.83
	06/01/2024	\$56.81	\$14.25	\$16.05	\$0.00	\$87.11
	12/01/2024	\$58.25	\$14.25	\$16.05	\$0.00	\$88.55
	06/01/2025	\$59.53	\$14.25	\$16.05	\$0.00	\$89.83
	12/01/2025	\$60.97	\$14.25	\$16.05	\$0.00	\$91.27
	06/01/2026	\$62.25	\$14.25	\$16.05	\$0.00	\$92.55
	12/01/2026			\$16.05	\$0.00	\$92.33
For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2020	\$63.69	\$14.25	\$10.03	\$0.00	\$93.99
RIDE-ON MOTORIZED BUGGY OPERATOR	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
LABORERS - ZONE I	06/01/2023	\$43.83	\$9.40	\$17.82	\$0.00	\$71.05
	12/01/2023	\$45.08	\$9.40	\$17.82	\$0.00	\$72.30
For apprentice rates see "Apprentice- LABORER"	12/01/2025	ψ+5.00	ψ2.40	ψ17.02	ψο.σο	Ψ/2.30
ROLLER/SPREADER/MULCHING MACHINE	12/01/2022	\$53.05	\$14.25	\$16.05	\$0.00	\$83.35
OPERATING ENGINEERS LOCAL 4	06/01/2023	\$54.29	\$14.25	\$16.05	\$0.00	\$84.59
	12/01/2023	\$55.53	\$14.25	\$16.05	\$0.00	\$85.83
	06/01/2024	\$56.81	\$14.25	\$16.05	\$0.00	\$87.11
	12/01/2024	\$58.25	\$14.25	\$16.05	\$0.00	\$88.55
	06/01/2025	\$58.23 \$59.53	\$14.25	\$16.05	\$0.00	\$89.83
				\$16.05	\$0.00	
	12/01/2025	\$60.97 \$62.25	\$14.25			\$91.27
	06/01/2026	\$62.25	\$14.25	\$16.05	\$0.00	\$92.55
	12/01/2026	\$63.69	\$14.25	\$16.05	\$0.00	\$93.99

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Classification For apprentic		Apprentice- (OPERATING ENGINEERS"		Effective Da	te Base Wage	e Health	Pension	Supplemental Unemployment	Total Ra
•		Vaterproofi	ng &Roofer Damproofg)		02/01/2023	3 \$48.53	\$12.78	\$20.20	\$0.00	\$81.51
ROOFERS LOCAI	L 33				08/01/2023	\$50.03	\$12.78	\$20.20	\$0.00	\$83.01
					02/01/2024	\$51.28	\$12.78	\$20.20	\$0.00	\$84.26
					08/01/2024	\$52.78	\$12.78	\$20.20	\$0.00	\$85.76
					02/01/2025	\$54.03	\$12.78	\$20.20	\$0.00	\$87.01
					08/01/2025	\$55.53	\$12.78	\$20.20	\$0.00	\$88.51
					02/01/2026	5 \$56.78	\$12.78	\$20.20	\$0.00	\$89.76
		ntice - Ro ve Date -	OOFER - Local 33 02/01/2023					Supplementa		
	Step	percent		Apprentic	e Base Wage	Health	Pension	Unemploymen		
	1	50			\$24.27	\$12.78	\$5.59	\$0.00	\$42.64	
	2	60			\$29.12	\$12.78	\$20.20	\$0.00	\$62.10	
	3	65			\$31.54	\$12.78	\$20.20	\$0.00	\$64.52	
	4	75			\$36.40	\$12.78	\$20.20	\$0.00	\$69.38	
	5	85			\$41.25	\$12.78	\$20.20	\$0.00	\$74.23	
	Effecti Step	ve Date -	08/01/2023	Apprentic	e Base Wage	Health	Pension	Supplementa Unemploymen		
	1	50			\$25.02	\$12.78	\$5.59	\$0.00		
	2	60			\$30.02	\$12.78	\$20.20	\$0.00		
	3	65			\$32.52	\$12.78	\$20.20	\$0.00		
	4	75			\$37.52	\$12.78	\$20.20	\$0.00		
	5	85			\$42.53	\$12.78	\$20.20	\$0.00		
		Step 1 is (Hot Pite	5-10, the 1:10; Reroofing: 1 2000 hrs.; Steps 2-5 are 100 h Mechanics' receive \$1.00 urneyworker Ratio:**	00 hrs.	OOFER)					
			AST CONCRETE		02/01/2026	0.070	¢12.70	\$20.20	\$0.00	¢01.76
OOFFR SLA		D / I ICEC	IST CONCILETE		02/01/2023	3 \$48.78	\$12.78	\$20.20	\$0.00	\$81.76
	L 33				09/01/2022			\$20.20	90.00	¢02 26
	L 33				08/01/2023	\$50.28	\$12.78	\$20.20 \$20.20	\$0.00 \$0.00	\$83.26
	L 33				02/01/2024	\$50.28 \$51.53	\$12.78 \$12.78	\$20.20	\$0.00	\$84.51
	L 33				02/01/2024 08/01/2024	\$50.28 \$51.53 \$53.03	\$12.78 \$12.78 \$12.78	\$20.20 \$20.20	\$0.00 \$0.00	\$84.51 \$86.01
	L 33				02/01/2024 08/01/2024 02/01/2025	\$50.28 \$51.53 \$53.03 \$54.28	\$12.78 \$12.78 \$12.78 \$12.78	\$20.20 \$20.20 \$20.20	\$0.00 \$0.00 \$0.00	\$84.51 \$86.01 \$87.26
OOFERS LOCAI					02/01/2024 08/01/2024	\$ \$50.28 4 \$51.53 4 \$53.03 5 \$54.28 5 \$55.78	\$12.78 \$12.78 \$12.78	\$20.20 \$20.20	\$0.00 \$0.00	\$84.51 \$86.01
For apprentic	e rates see "		ROOFER"		02/01/2024 08/01/2024 02/01/2025 08/01/2025	\$50.28 \$51.53 \$53.03 \$54.28 \$55.78 \$57.03	\$12.78 \$12.78 \$12.78 \$12.78 \$12.78 \$12.78	\$20.20 \$20.20 \$20.20 \$20.20	\$0.00 \$0.00 \$0.00 \$0.00	\$84.51 \$86.01 \$87.26 \$88.76
For apprentic	e rates see " L WORK	ER	ROOFER"		02/01/2024 08/01/2024 02/01/2025 08/01/2026	\$ \$50.28 4 \$51.53 4 \$53.03 5 \$54.28 5 \$55.78 6 \$57.03	\$12.78 \$12.78 \$12.78 \$12.78 \$12.78	\$20.20 \$20.20 \$20.20 \$20.20 \$20.20	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$84.51 \$86.01 \$87.26 \$88.76 \$90.01
For apprentic	e rates see " L WORK	ER	ROOFER"		02/01/2024 08/01/2024 02/01/2025 08/01/2025 02/01/2026	\$50.28 \$51.53 \$53.03 \$54.28 \$55.78 \$57.03 \$55.31 \$57.01	\$12.78 \$12.78 \$12.78 \$12.78 \$12.78 \$12.78	\$20.20 \$20.20 \$20.20 \$20.20 \$20.20	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$84.51 \$86.01 \$87.26 \$88.76 \$90.01 \$98.89 \$100.59
For apprentic	e rates see " L WORK	ER	ROOFER"		02/01/2024 08/01/2024 02/01/2025 08/01/2026 02/01/2026 02/01/2023	\$50.28 \$51.53 \$53.03 \$54.28 \$55.78 \$57.03 \$55.31 \$57.01 \$58.71	\$12.78 \$12.78 \$12.78 \$12.78 \$12.78 \$12.78 \$14.11 \$14.11	\$20.20 \$20.20 \$20.20 \$20.20 \$20.20 \$26.64	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$2.83 \$2.83	\$84.51 \$86.01 \$87.26 \$88.76 \$90.01 \$98.89 \$100.55 \$102.29
For apprentic	e rates see " L WORK	ER	ROOFER"		02/01/2024 08/01/2024 02/01/2025 08/01/2026 02/01/2026 02/01/2023 08/01/2024 08/01/2024	\$50.28 \$51.53 \$53.03 \$54.28 \$55.78 \$57.03 \$55.31 \$57.01 \$60.46	\$12.78 \$12.78 \$12.78 \$12.78 \$12.78 \$12.78 \$14.11 \$14.11 \$14.11	\$20.20 \$20.20 \$20.20 \$20.20 \$20.20 \$26.64 \$26.64	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$2.83 \$2.83	\$84.51 \$86.01 \$87.26 \$88.76 \$90.01 \$98.89 \$100.55 \$104.04
OOFERS LOCAI	e rates see " L WORK	ER	ROOFER"		02/01/2024 08/01/2025 08/01/2025 08/01/2025 02/01/2026 02/01/2023 08/01/2023	\$50.28 \$51.53 \$53.03 \$54.28 \$55.78 \$57.03 \$55.31 \$57.01 \$4 \$60.46 \$62.21	\$12.78 \$12.78 \$12.78 \$12.78 \$12.78 \$12.78 \$14.11 \$14.11	\$20.20 \$20.20 \$20.20 \$20.20 \$20.20 \$26.64 \$26.64 \$26.64	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$2.83 \$2.83 \$2.83	\$84.51 \$86.01 \$87.26 \$88.76 \$90.01

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Total Rate

Effective Date Base Wage Health Pension

	Step	ve Date - 02/01/2023 percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Ra	te
	1	42	\$23.23	\$14.11	\$6.13	\$0.00	\$43.4	! 7
	2	42	\$23.23	\$14.11	\$6.13	\$0.00	\$43.4	17
	3	47	\$26.00	\$14.11	\$11.90	\$1.54	\$53.5	55
	4	47	\$26.00	\$14.11	\$11.90	\$1.54	\$53.5	55
	5	52	\$28.76	\$14.11	\$12.88	\$1.65	\$57.4	10
	6	52	\$28.76	\$14.11	\$13.13	\$1.65	\$57.6	55
	7	60	\$33.19	\$14.11	\$14.54	\$1.83	\$63.6	57
	8	65	\$35.95	\$14.11	\$15.52	\$1.94	\$67.5	52
	9	75	\$41.48	\$14.11	\$17.48	\$2.16	\$75.2	23
	10	85	\$47.01	\$14.11	\$18.94	\$2.36	\$82.4	12
	Effecti Step	ve Date - 08/01/2023 percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Ra	te
	1	42	\$23.94	\$14.11	\$6.13	\$0.00	\$44.1	
	2	42	\$23.94	\$14.11	\$6.13	\$0.00	\$44.1	
	3	47	\$26.79	\$14.11	\$11.90	\$1.58	\$54.3	
	4	47	\$26.79	\$14.11	\$11.90	\$1.58	\$54.3	
	5	52	\$29.65	\$14.11	\$12.88	\$1.70	\$58.3	
	6	52	\$29.65	\$14.11	\$13.13	\$1.70	\$58.5	
	7	60	\$34.21	\$14.11	\$14.54	\$1.89	\$64.7	
	8	65	\$37.06	\$14.11	\$15.52	\$2.00	\$68.6	
	9	75	\$42.76	\$14.11	\$17.48	\$2.23	\$76.5	
	10	85	\$48.46	\$14.11	\$18.94	\$2.45	\$83.9	
	Notes:							
		Steps are 6 mos.						
ı	Appre	ntice to Journeyworker Ratio:1:4						
		I MOVING EQUIP < 35 TONS IL NO. 10 ZONE A	12/01/202	1 \$37.34	\$13.41	\$16.01	\$0.00	\$66.76
		I MOVING EQUIP > 35 TONS IL NO. 10 ZONE A	12/01/202	1 \$37.63	\$13.41	\$16.01	\$0.00	\$67.05
NKLER FI		I 550 (Section 1) Zone I	03/01/202	3 \$66.20	\$10.90	\$23.20	\$0.00	\$100.3
KLEK FILIER	is LUCAI	L 550 - (Section A) Zone 1	10/01/2023	3 \$67.95	\$10.90	\$23.20	\$0.00	\$102.0
			03/01/2024	4 \$69.75	\$10.90	\$23.20	\$0.00	\$103.8
			10/01/2024	4 \$71.55	\$10.90	\$23.20	\$0.00	\$105.6
			03/01/202	5 \$73.35	\$10.90	\$23.20	\$0.00	\$107.4

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Total Rate

Pension

Apprentice - SPRINKLER FITTER - Local 550 (Section A) Zone 1 03/01/2023 **Effective Date -**Supplemental percent Apprentice Base Wage Health Pension Unemployment Total Rate Step 1 35 \$23.17 \$10.90 \$9.70 \$43.77 \$0.00 2 40 \$26.48 \$10.90 \$9.70 \$0.00 \$47.08 3 45 \$29.79 \$10.90 \$9.70 \$0.00 \$50.39 4 50 \$33.10 \$10.90 \$9.70 \$0.00 \$53.70 5 55 \$0.00 \$36.41 \$10.90 \$9.70 \$57.01 6 60 \$39.72 \$10.90 \$11.20 \$0.00 \$61.82 7 65 \$43.03 \$10.90 \$11.20 \$0.00 \$65.13 8 70 \$46.34 \$10.90 \$11.20 \$0.00 \$68.44 9 75 \$49.65 \$10.90 \$11.20 \$0.00 \$71.75 10 80 \$52.96 \$10.90 \$11.20 \$0.00 \$75.06 10/01/2023 **Effective Date -**Supplemental Step percent Apprentice Base Wage Health Pension Unemployment Total Rate 1 35 \$23.78 \$10.90 \$9.70 \$0.00 \$44.38 2 40 \$10.90 \$0.00 \$27.18 \$9.70 \$47.78 3 45 \$30.58 \$10.90 \$9.70 \$0.00 \$51.18 4 50 \$33.98 \$9.70 \$0.00 \$10.90 \$54.58 5 55 \$37.37 \$10.90 \$9.70 \$0.00 \$57.97 6 60 \$40.77 \$10.90 \$11.20 \$0.00 \$62.87 7 65 \$44.17 \$10.90 \$11.20 \$0.00 \$66.27 8 70 \$47.57 \$10.90 \$11.20 \$0.00 \$69.67 9 75 \$50.96 \$10.90 \$11.20 \$0.00 \$73.06 10 80 \$54.36 \$10.90 \$11.20 \$0.00 \$76.46 |**Notes:** Apprentice entered prior 9/30/10: 40/45/50/55/60/65/70/75/80/85 Steps are 850 hours Apprentice to Journeyworker Ratio:1:3 STEAM BOILER OPERATOR 12/01/2022 \$53.05 \$14.25 \$16.05 \$0.00 \$83.35 OPERATING ENGINEERS LOCAL 4 \$0.00 06/01/2023 \$16.05 \$84.59 \$54.29 \$14.25 \$16.05 \$0.00 12/01/2023 \$55.53 \$14.25 \$85.83 \$16.05 \$0.00 06/01/2024 \$56.81 \$14.25 \$87.11 12/01/2024 \$58.25 \$14.25 \$16.05 \$0.00 \$88.55 06/01/2025 \$16.05 \$0.00 \$89.83 \$59.53 \$14.25 12/01/2025 \$60.97 \$14.25 \$16.05 \$0.00 \$91.27 06/01/2026 \$16.05 \$0.00 \$62.25 \$14.25 \$92.55 \$0.00 12/01/2026 \$63.69 \$14.25 \$16.05 \$93.99 For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN	12/01/2022	\$53.05	\$14.25	\$16.05	\$0.00	\$83.35
OPERATING ENGINEERS LOCAL 4	06/01/2023	\$54.29	\$14.25	\$16.05	\$0.00	\$84.59
	12/01/2023	\$55.53	\$14.25	\$16.05	\$0.00	\$85.83
	06/01/2024	\$56.81	\$14.25	\$16.05	\$0.00	\$87.11
	12/01/2024	\$58.25	\$14.25	\$16.05	\$0.00	\$88.55
	06/01/2025	\$59.53	\$14.25	\$16.05	\$0.00	\$89.83
	12/01/2025	\$60.97	\$14.25	\$16.05	\$0.00	\$91.27
	06/01/2026	\$62.25	\$14.25	\$16.05	\$0.00	\$92.55
For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2026	\$63.69	\$14.25	\$16.05	\$0.00	\$93.99
TELECOMMUNICATION TECHNICIAN ELECTRICIANS LOCAL 103	03/01/2023	\$47.38	\$13.00	\$19.63	\$0.00	\$80.01

Annrentice -	TELECOMMUNICATION TECHNICIAN - Local 103

Effecti	ve Date -	03/01/2023				Supplemental	
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	45		\$21.32	\$13.00	\$0.65	\$0.00	\$34.97
2	45		\$21.32	\$13.00	\$0.65	\$0.00	\$34.97
3	50		\$23.69	\$13.00	\$15.20	\$0.00	\$51.89
4	50		\$23.69	\$13.00	\$15.20	\$0.00	\$51.89
5	55		\$26.06	\$13.00	\$15.58	\$0.00	\$54.64
6	60		\$28.43	\$13.00	\$15.96	\$0.00	\$57.39
7	65		\$30.80	\$13.00	\$16.34	\$0.00	\$60.14
8	70		\$33.17	\$13.00	\$16.73	\$0.00	\$62.90
9	75		\$35.54	\$13.00	\$17.11	\$0.00	\$65.65
10	80		\$37.90	\$13.00	\$17.48	\$0.00	\$68.38
Notes:							. — — —

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS	02/01/2023	\$59.29	\$11.49	\$22.34	\$0.00	\$93.12
BRICKLAYERS LOCAL 3 - MARBLE & TILE	08/01/2023	\$61.34	\$11.49	\$22.34	\$0.00	\$95.17
	02/01/2024	\$62.59	\$11.49	\$22.34	\$0.00	\$96.42
	08/01/2024	\$64.69	\$11.49	\$22.34	\$0.00	\$98.52
	02/01/2025	\$65.99	\$11.49	\$22.34	\$0.00	\$99.82
	08/01/2025	\$68.14	\$11.49	\$22.34	\$0.00	\$101.97
	02/01/2026	\$69.49	\$11.49	\$22.34	\$0.00	\$103.32
	08/01/2026	\$71.69	\$11.49	\$22.34	\$0.00	\$105.52
	02/01/2027	\$73.09	\$11.49	\$22.34	\$0.00	\$106.92

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Pension

Total Rate

	Step	ve Date - 02/01/2023 percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
	1	50	\$29.65	\$11.49	\$22.34	\$0.00	\$63.48	
	2	60	\$35.57	\$11.49	\$22.34	\$0.00	\$69.40	
	3	70	\$41.50	\$11.49	\$22.34	\$0.00	\$75.33	
	4	80	\$47.43	\$11.49	\$22.34	\$0.00	\$81.26	
	5	90	\$53.36	\$11.49	\$22.34	\$0.00	\$87.19	
	Effecti Step	ve Date - 08/01/2023 percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
	1	50	\$30.67	\$11.49	\$22.34	\$0.00	\$64.50	
	2	60	\$36.80	\$11.49	\$22.34	\$0.00	\$70.63	
	3	70	\$42.94	\$11.49	\$22.34	\$0.00	\$76.77	
	4	80	\$49.07	\$11.49	\$22.34	\$0.00	\$82.90	
	5	90	\$55.21	\$11.49	\$22.34	\$0.00	\$89.04	
	Notes:							
	Appre	ntice to Journeyworker Ratio:1	:3					
ST BORING			12/01/2022	2 \$46.58	8 \$9.35	\$17.97	\$0.00	\$73.90
OKEKS - FOUI	VDAITON	AND MARINE	06/01/2023	3 \$47.58	8 \$9.40	\$17.97	\$0.00	\$74.95
			12/01/2023	3 \$48.83	3 \$9.40	\$17.97	\$0.00	\$76.20
			06/01/2024	4 \$50.3	1 \$9.40	\$17.97	\$0.00	\$77.68
			12/01/2024	4 \$51.78	8 \$9.40	\$17.97	\$0.00	\$79.15
			06/01/202	5 \$53.28	8 \$9.40	\$17.97	\$0.00	\$80.65
			12/01/202	5 \$54.78	8 \$9.40	\$17.97	\$0.00	\$82.15
			06/01/2020	556.33	3 \$9.40	\$17.97	\$0.00	\$83.70
			12/01/2020	6 \$57.83	3 \$9.40	\$17.97	\$0.00	\$85.20
		Apprentice- LABORER"						
ST BORING BORERS - FOUR		ER HELPER	12/01/2022	2 \$42.70	0 \$9.35	\$17.97	\$0.00	\$70.02
JORDAN - FOUT	,D/1110/N	THE MAINTE	06/01/2023	3 \$43.70	9.40	\$17.97	\$0.00	\$71.07
			12/01/202	3 \$44.9:	5 \$9.40	\$17.97	\$0.00	\$72.32
			06/01/2024	4 \$46.43	3 \$9.40	\$17.97	\$0.00	\$73.80
			12/01/2024	4 \$47.90	9.40	\$17.97	\$0.00	\$75.27
			06/01/202	5 \$49.40	0 \$9.40	\$17.97	\$0.00	\$76.77
			12/01/202	5 \$50.90	9.40	\$17.97	\$0.00	\$78.27
			06/01/2020	6 \$52.4:	5 \$9.40	\$17.97	\$0.00	\$79.82
				6 \$53.93		\$17.97	\$0.00	\$81.32

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TEST BORING LABORER	12/01/2022	\$42.58	\$9.35	\$17.97	\$0.00	\$69.90
ABORERS - FOUNDATION AND MARINE	06/01/2023	\$43.58	\$9.40	\$17.97	\$0.00	\$70.95
	12/01/2023	\$44.83	\$9.40	\$17.97	\$0.00	\$72.20
	06/01/2024	\$46.31	\$9.40	\$17.97	\$0.00	\$73.68
	12/01/2024	\$47.78	\$9.40	\$17.97	\$0.00	\$75.15
	06/01/2025	\$49.28	\$9.40	\$17.97	\$0.00	\$76.65
	12/01/2025	\$50.78	\$9.40	\$17.97	\$0.00	\$78.15
	06/01/2026	\$52.33	\$9.40	\$17.97	\$0.00	\$79.70
	12/01/2026	\$53.83	\$9.40	\$17.97	\$0.00	\$81.20
For apprentice rates see "Apprentice- LABORER"				****		
FRACTORS/PORTABLE STEAM GENERATORS OPERATING ENGINEERS LOCAL 4	12/01/2022	\$53.05	\$14.25	\$16.05	\$0.00	\$83.35
	06/01/2023	\$54.29	\$14.25	\$16.05	\$0.00	\$84.59
	12/01/2023	\$55.53	\$14.25	\$16.05	\$0.00	\$85.83
	06/01/2024	\$56.81	\$14.25	\$16.05	\$0.00	\$87.11
	12/01/2024	\$58.25	\$14.25	\$16.05	\$0.00	\$88.55
	06/01/2025	\$59.53	\$14.25	\$16.05	\$0.00	\$89.83
	12/01/2025	\$60.97	\$14.25	\$16.05	\$0.00	\$91.27
	06/01/2026	\$62.25	\$14.25	\$16.05	\$0.00	\$92.55
	12/01/2026	\$63.69	\$14.25	\$16.05	\$0.00	\$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS" CRAILERS FOR EARTH MOVING EQUIPMENT EAMSTERS JOINT COUNCIL NO. 10 ZONE A	12/01/2021	\$37.92	\$13.41	\$16.01	\$0.00	\$67.34
TUNNEL WORK - COMPRESSED AIR	12/01/2022	\$54.81	\$9.35	\$18.42	\$0.00	\$82.58
ABORERS (COMPRESSED AIR)	06/01/2023	\$55.81	\$9.40	\$18.42	\$0.00	\$83.63
	12/01/2023	\$57.06	\$9.40	\$18.42	\$0.00	\$84.88
	06/01/2024	\$58.54	\$9.40	\$18.42	\$0.00	\$86.36
	12/01/2024	\$60.01	\$9.40	\$18.42	\$0.00	\$87.83
	06/01/2025	\$61.51	\$9.40	\$18.42	\$0.00	\$89.33
	12/01/2025	\$63.01	\$9.40	\$18.42	\$0.00	\$90.83
	06/01/2026	\$64.56	\$9.40	\$18.42	\$0.00	\$92.38
	12/01/2026	\$66.06	\$9.40	\$18.42	\$0.00	\$93.88
For apprentice rates see "Apprentice- LABORER" TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE)	12/01/2022	Φ7.6.01	ФО 2.5	¢10.42	\$0.00	Ф04.50
ABORERS (COMPRESSED AIR)	12/01/2022	\$56.81	\$9.35	\$18.42	\$0.00	\$84.58
	06/01/2023	\$57.81	\$9.40	\$18.42	\$0.00	\$85.63
	12/01/2023	\$59.06	\$9.40	\$18.42	\$0.00	\$86.88
	06/01/2024	\$60.54	\$9.40	\$18.42	\$0.00	\$88.36
	12/01/2024	\$62.01	\$9.40	\$18.42	\$0.00	\$89.83
	06/01/2025	\$63.51	\$9.40	\$18.42	\$0.00	\$91.33
	12/01/2025	\$65.01	\$9.40	\$18.42	\$0.00	\$92.83
	06/01/2026	\$66.56	\$9.40	\$18.42	\$0.00	\$94.38
For apprentice rates see "Apprentice- LABORER"	12/01/2026	\$68.06	\$9.40	\$18.42	\$0.00	\$95.88
1 of apprentice rates see Apprentice- LABORER						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - FREE AIR	12/01/2022	\$46.88	\$9.35	\$18.42	\$0.00	\$74.65
LABORERS (FREE AIR TUNNEL)	06/01/2023	\$47.88	\$9.40	\$18.42	\$0.00	\$75.70
	12/01/2023	\$49.13	\$9.40	\$18.42	\$0.00	\$76.95
	06/01/2024	\$50.61	\$9.40	\$18.42	\$0.00	\$78.43
	12/01/2024	\$52.08	\$9.40	\$18.42	\$0.00	\$79.90
	06/01/2025	\$53.58	\$9.40	\$18.42	\$0.00	\$81.40
	12/01/2025	\$55.08	\$9.40	\$18.42	\$0.00	\$82.90
	06/01/2026	\$56.63	\$9.40	\$18.42	\$0.00	\$84.45
	12/01/2026	\$58.13	\$9.40	\$18.42	\$0.00	\$85.95
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) LABORERS (FREE AIR TUNNEL)	12/01/2022	\$48.88	\$9.35	\$18.42	\$0.00	\$76.65
	06/01/2023	\$49.88	\$9.40	\$18.42	\$0.00	\$77.70
	12/01/2023	\$51.13	\$9.40	\$18.42	\$0.00	\$78.95
	06/01/2024	\$52.61	\$9.40	\$18.42	\$0.00	\$80.43
	12/01/2024	\$54.08	\$9.40	\$18.42	\$0.00	\$81.90
	06/01/2025	\$55.58	\$9.40	\$18.42	\$0.00	\$83.40
	12/01/2025	\$57.08	\$9.40	\$18.42	\$0.00	\$84.90
	06/01/2026	\$58.63	\$9.40	\$18.42	\$0.00	\$86.45
For apprentice rates see "Apprentice- LABORER"	12/01/2026	\$60.13	\$9.40	\$18.42	\$0.00	\$87.95
VAC-HAUL TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	12/01/2021	\$37.34	\$13.41	\$16.01	\$0.00	\$66.76
WAGON DRILL OPERATOR	12/01/2022	\$43.43	\$9.10	\$17.57	\$0.00	\$70.10
LABORERS - ZONE 1	06/01/2023	\$43.83	\$9.40	\$17.82	\$0.00	\$71.05
For apprentice rates see "Apprentice- LABORER"	12/01/2023	\$45.08	\$9.40	\$17.82	\$0.00	\$72.30
WAGON DRILL OPERATOR (HEAVY & HIGHWAY)	12/01/2022	\$42.83	\$9.35	\$17.82	\$0.00	\$70.00
LABORERS - ZONE 1 (HEAVY & HIGHWAY)	06/01/2023	\$43.83	\$9.40	\$17.82	\$0.00	\$71.05
	12/01/2023	\$45.08	\$9.40	\$17.82	\$0.00	\$72.30
	06/01/2024	\$46.56	\$9.40	\$17.82	\$0.00	\$73.78
	12/01/2024	\$48.03	\$9.40	\$17.82	\$0.00	\$75.25
	06/01/2025	\$49.53	\$9.40	\$17.82	\$0.00	\$76.75
	12/01/2025	\$51.03	\$9.40	\$17.82	\$0.00	\$78.25
	06/01/2026	\$52.58	\$9.40	\$17.82	\$0.00	\$79.80
	12/01/2026	\$54.08	\$9.40	\$17.82	\$0.00	\$81.30
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)		·				
WASTE WATER PUMP OPERATOR	12/01/2022	\$53.63	\$14.25	\$16.05	\$0.00	\$83.93
OPERATING ENGINEERS LOCAL 4	06/01/2023	\$54.88	\$14.25	\$16.05	\$0.00	\$85.18
	12/01/2023	\$56.13	\$14.25	\$16.05	\$0.00	\$86.43
	06/01/2024	\$57.43	\$14.25	\$16.05	\$0.00	\$87.73
	12/01/2024	\$58.88	\$14.25	\$16.05	\$0.00	\$89.18
	06/01/2025	\$60.18	\$14.25	\$16.05	\$0.00	\$90.48
	12/01/2025	\$61.63	\$14.25	\$16.05	\$0.00	\$91.93
	06/01/2026	\$62.93	\$14.25	\$16.05	\$0.00	\$93.23
	12/01/2026	\$64.38	\$14.25	\$16.05	\$0.00	\$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
WATER METER INSTALLER	02/26/2023	\$64.69	\$14.07	\$18.86	\$0.00	\$97.62
PLUMBERS & GASFITTERS LOCAL 12	09/03/2023	\$66.44	\$14.07	\$18.86	\$0.00	\$99.37
	03/03/2024	\$68.24	\$14.07	\$18.86	\$0.00	\$101.17
	09/01/2024	\$70.04	\$14.07	\$18.86	\$0.00	\$102.97
	03/02/2025	\$71.84	\$14.07	\$18.86	\$0.00	\$104.77
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GAS	FITTER"					

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

 $All \ apprentices \ must be \ registered \ with \ the \ Division \ of \ Apprentices hip \ Training \ in \ accordance \ with \ M.G.L. \ c. \ 23, \ ss. \ 11E-11L.$

All steps are six months (1000 hours.)

Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

- ** Multiple ratios are listed in the comment field.
- *** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
- **** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

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SECTION 011000

GENERAL REQUIREMENTS

1.1	Related Documents	1.11	Submittals
1.2	Project Requirements	1.12	Warranties
1.3	Specification Information	1.13	Cutting and Patching
1.4	Definitions	1.14	Temporary Facilities and Utilities
1.5	Industry Standards	1.15	Products and Substitutions
1.6	Codes and Regulations	1.16	Delivery, Storage and Handling
1.7	Progress Schedule	1.17	Labels
1.8	Schedule of Values	1.18	Record Documents
1.9	Payment Requests	1.19	Project Close Out
1.10	Procedures and Controls	1.20	Final Cleaning and Repair

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 PROJECT REQUIREMENTS

- A. Project Identification: Office of Career Services Renovation Project, Harvard University Faculty of Arts and Sciences, 54 Dunster Street, Cambridge, Massachusetts.
- B. Project Requirements for Temporary Utilities and Facilities:
 - 1. Utility Costs: The Owner will allow the use of existing utility systems and pay for cost of utility services consumed, including electricity, water and gas. Do not waste.
 - 2. Temporary Offices: A separate field office for the Architect and the Owner's Representative is not required.
 - 3. Toilet Facilities: The Contractor shall make use of only Staff Restrooms in the building. A separate temporary toilet facility is not required.
- C. Permits and Fees: Apply for and obtain permits required to perform the work. Permit fees will be waived by the Town of Arlington. Submit copies to Architect.
- D. Codes: Comply with applicable codes and regulations of authorities having jurisdiction. Submit copies of inspection reports, notices and similar communications to Architect.
- E. Dimensions: Verify dimensions indicated on drawings with field dimensions before fabrication or ordering of materials. Do not scale drawings.
- F. Existing Conditions: Notify Architect of existing conditions differing from those indicated on the drawings.

- G. Contractor's Conduct on Premises: The Contractor and their employees shall behave in a respectful, courteous and safe manner. Abusive, harassing, and lewd behavior is prohibited. Music playing is prohibited. Alcohol, tobacco, and drug use is prohibited.
 - 1. Comply with Owner's security requirements.

1.3 SPECIFICATION INFORMATION

- A. These specifications are a specialized form of technical writing edited from master specifications and contain deviations from traditional writing formats. Capitalization, underlining and bold print is only used to assist reader in finding information and no other meaning is implied.
- B. Except where specifically indicated otherwise, the subject of all imperative statements is the Contractor.
- C. Sections are generally numbered in conformance with Construction Specifications Institute Masterformat System. Numbering sequence is not consecutive. Refer to the table of contents for names and numbers of sections included in this Project.
- D. Pages are numbered separately for each section. Each section is noted with "End of Section" to indicate the last page of a section.

1.4 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.5 INDUSTRY STANDARDS

- A. Referenced standards are part of the Contract Documents and have the same force and effect as if bound with these specifications.
- B. Except where specifically indicated otherwise, comply with the current standard in effect as of the date of the Owner/Contractor Agreement. Obtain copies of industry standards directly from publisher.
- C. The titles of industry standard organizations are commonly abbreviated; full titles may be found in Encyclopedia of Associations or consult Architect.

1.6 CODES AND REGULATIONS

- A. Comply with all applicable codes, ordinances, regulations and requirements of authorities having jurisdiction.
- B. Submit copies of all permits, licenses, certifications, inspection reports, releases, notices, judgments, and communications from authorities having jurisdiction to the Architect.

1.7 PROGRESS SCHEDULE

A. Provide comprehensive bar chart schedule showing all major and critical minor portions of the work, sequence of work and duration of each activity. Update and reissue regularly, but not less than monthly.

1.8 SCHEDULE OF VALUES

A. Prepare Schedule of Values to coordinate with application for payment breakdown. Submit at least 10 days before first payment application. Update and reissue regularly, but not less than monthly.

1.9 PAYMENT REQUESTS

- A. Provide three copies of each request on completely filled out copies of AIA G702 and continuation sheet G703. Substantiate requests with complete documentation; include change orders to date. Provide partial lien waivers for work in progress and full lien waivers for completed work.
- B. Record Drawing Certification: Certify as a part of each application for payment that the project record documents are current at the time of application is submitted. The Contractor shall require such drawings to be current as a condition of approving any payment to the trade Contractor and Subcontractor.
- C. Before first payment application, provide the following:
 - 1. List of subcontractors, suppliers and fabricators.
 - 2. Schedule of values.
 - 3. Progress schedule.
 - 4. Submittal schedule keyed to project schedule.
 - 5. List of Contractor's key project personnel.
 - 6. Copies of permits and other communications from authorities.
 - 7. Contractor's certificate of insurance.
 - 8. Performance and payment bonds if required.
 - 9. Unit price schedule.

- D. Before final payment application, provide and complete the following:
 - 1. Complete closeout requirements.
 - 2. Complete punch list items.
 - Settle all claims.
 - Transmit record documents to Architect.
 - 5. Prove that all taxes, fees and similar obligations have been paid.
 - 6. Remove temporary facilities and surplus materials.
 - 7. Change lock cylinders or cores.
 - 8. Clean the work.
 - 9. Submit consent of surety, if any, for final payment.

1.10 PROCEDURES AND CONTROLS

- A. Project Meetings: Arrange for and attend meetings with the Architect and such other persons as the Architect requests to have present. The Contractor shall be represented by a principal, project manager, general superintendent or other authorized main office representative, as well as by the Contractor's field superintendent. An authorized representative of any subcontractor or subsubcontractor shall attend such meetings if the representative's presence is requested by the Architect. Such representatives shall be empowered to make binding commitments on all matters to be discussed at such meetings, including costs, payments, change orders, time schedules and manpower. Any notices required under the Contract may be served on such representatives. Written reports of meeting minutes shall be prepared by the Contractor and distributed by the Contractor to attendees, the Architect, and Owner within three business days.
 - 1. Pre-Construction Conference: Attendance by Architect, Contractor, major subcontractors. Agenda shall include: Quality of workmanship, coordination, interpretations, job schedule, submittals, approvals, requisition procedures, testing, protection of construction, indoor air quality, and construction waste management.
 - 2. Interior Finishes Meeting: Attendance by Architect, Contractor, major subcontractors. Agenda shall include as applicable: Quality of workmanship, environmental conditions for application of finishes, drywall details, millwork details, condition of surfaces to receive finishes, tile work, painting work, samples and test areas and approvals, coordination with mechanical and electrical interfaces and penetrations, indoor air quality.
 - 3. Progress Meetings: Hold regularly before preparation of payment requests and additional meetings as requested by the Architect. Attendance by Architect, Contractor, and others as determined by Contractor. Agenda shall include work in progress and payment requests.
 - 4. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction, as specified. Preinstallation Conferences may be part of Progress Meeting agenda. Attendance by Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow. Agenda shall include a review of progress of other construction activities and preparations for the particular activity under consideration.
- B. Emergency Contacts: Furnish the Owner and Architect, in writing, the names and telephone numbers of individuals to be contacted in the event of an out-of-hours emergency at the building site. Post a similar list readily visible from the outside of the field office or a location acceptable to the Architect.
- C. Layout: Layout work and be responsible for all lines, elevations, and measurements of the building, grading, utilities and other work executed under the contract.

- D. Field Measurements: Verify measurements at the building prior to ordering materials or commencing work. No extra charge or compensation will be allowed because of differences between actual dimensions and measurements indicated on the Drawings. Differences which may be found shall be submitted to the Architect for decision before proceeding with the work.
- E. Field Measurements for Fixed Equipment: Dimensions for fixed equipment to be supplied under this Contract or separate contracts shall be determined by field measurements taken jointly by the Contractor and the equipment supplier involved. A record of the field measurements shall be kept until time of substantial completion of the project, or until the equipment has been fully installed and accepted by the Owner, whichever is later. Responsibility for fixed equipment fabricated accurately to field measurements for proper fit and operation shall be that of the Contractor. Contractor shall pay all costs involved in correcting any misfitting fixed equipment as fabricated.
- F. Project Limit Line: The boundaries of the site do not limit the responsibility of the Contractor to perform the work in its entirety. Make utility connections as indicated.
- G. Matching: Where matching is indicated, the Architect shall be the sole and final judge of what is an acceptable match. Mockups and sample submissions are required.
- H. Observation: Notify the Architect and authorities having jurisdiction at least thirty-six hours in advance of concealing any work.
- I. Utilities: Prior to interrupting utilities, services or facilities, notify the utility owner and the Owner and obtain their written approval a minimum 48 hours in advance.
- J. Furnishings, Fixtures, and Equipment: Cooperate and permit the Owner to install their furnishings and equipment during the progress of the work. Owner's installation of furnishings or equipment does not signify Owner's acceptance of any portion of the work.
- K. Clean-Up: Frequently clean-up all waste, remove from site regularly, and legally dispose of off-site. Comply with requirements of Section 017400 CONSTRUCTION WASTE MANAGEMENT.
- L. Installer's Acceptance of Conditions: All installers shall inspect substrates and conditions under which work is to be executed and shall report in writing to the Contractor all conditions detrimental to the proper execution and completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning work means installer accepts previous work and conditions.
- M. Coordination: The Contractor shall be fully responsible for coordinating all trades, coordinating construction sequences and schedules, and coordinating the actual installed location and interface of all work.
 - 1. Prior to beginning mechanical, electrical and fire protection work, the Contractor shall prepare coordination drawings showing the exact alignment, physical location and configuration of the mechanical, electrical and fire protection installations and demonstrating to the Contractor's satisfaction that the installations will clear all obstructions, permit proper clearances for the Work of other trades, and present an orderly appearance where exposed. The Contractor shall be solely liable and responsible for any costs and delays resulting from the Contractor's failure to prepare such coordination drawings or from the negligent preparation of such coordination drawings.
 - 2. Exact locations and groupings of mechanical, electrical and fire protection fixtures, switches, heads and outlets shall be obtained from the Architect before the Work is roughed in. Work installed without such information from the Architect shall be relocated at the Contractor's expense if the Architect so requests.

N. Request For Interpretation (RFIs):

- 1. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
 - a. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
- 2. Content of the RFI: Include a detailed, legible description of item needing interpretation.
- 3. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow three working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
- 4. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.
- O. Existing Articles of Unusual Value: If during demolition, excavation, or disposal work articles of unusual value or of historical or archaeological significance are encountered, the ownership of such articles is retained by the Owner, and information regarding their discovery shall be immediately furnished to the Architect. If the nature of the article is such that work cannot proceed without danger of damage, work in the area shall be immediately discontinued until the Architect has determined the proper procedure to be followed. Delays in time thereby shall be a condition for which the time of the Contract may be extended. Costs incurred after discovery in the salvaging of such articles shall be borne by the Owner.

1.11 SUBMITTALS

- A. Required Submittals: Submit shop drawings, product data, initial selection samples, verification samples, calculations, coordination drawings, schedules, and all other submittals as specified in individual specification sections.
 - 1. Provide submittals for cleaning and maintenance products to be used during construction and final cleaning.
- B. Submittal Schedule: Within 30 days after award of contract and before first application for payment, prepare list of submittals in chronological sequence showing all submittals and proposed date first due at Architect's office and proposed date due to be returned to Contractor. Note relevant specification section number.
- C. Contractor's Preparation of Submittals: Modify and customize all submittals to show interface with adjacent work and attachment to building. Identify each submittal with name of project, date, Contractor's name, subcontractor's name, manufacturer's name, submittal name, relevant specification section numbers, and Submittal Schedule reference number. Stamp and sign each submittal to show the Contractor's review and approval of each submittal before delivery to Architect's office; unstamped and unsigned submittals will be returned without action by the Architect. Leave 4" x 6" open space for Architect's "action" stamp.
 - Electronic Submittals: Provide a copy of all submittals in electronic format to the Architect.
 Architect will return a file of reviewed submittal in electronic format to the Contractor for distribution to subcontractors, suppliers, fabricators, governing authorities and others as necessary for proper performance of the Work. Unless otherwise amenable to the

- Architect, additional hard copies of submittals will not be reviewed by the Architect (or Consultant) and will not be returned to the Contractor.
- 2. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
- 3. Name file with submittal number or other unique identifier, including revision identifier.
- 4. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect and Construction Manager.
- 5. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Architect.
- D. Product Data: Provide manufacturer's preprinted literature including, without limitation, manufacturer's standard printed description of product, materials and construction, recommendations for application and use, certification of compliance with standards, instructions for installation, and special coordination requirements. Collect data into one submittal for each unit of work or system; mark each copy to show which choices and options are applicable to project.
 - 1. Installer Copy: Verify that the Installer has a current copy of the relevant product data, including installation instructions, before permitting installation to begin.
- E. Shop Drawings: Provide accurately prepared, large scale and detailed shop drawings prepared specifically for this project. Show adjacent conditions and related work. Show accurate field dimensions and clearly note field conditions. Identify materials and products in the work shown. Note special coordination required.
 - 1. After Architect's action, follow specified distribution procedure.
- F. Samples: Provide units identical with final materials and products to be installed in the work. Where indicated, prepare samples to match Architect's sample. Label each sample with description, source, generic name or manufacturer's name and model number. Architect will review samples for confirmation of visual design intent, color, pattern, texture and type only; Architect will not test samples for compliance with other Contract requirements which shall remain the exclusive responsibility of the Contractor.
 - 1. Initial Selection Samples Submittal Quantities: For initial selection purposes, submit 1 set of samples showing the complete range of colors and finishes available.
 - 2. Verification Samples Submittal Quantities: For verification of an initial selection, submit 3 sets of samples; one set will be returned to Contractor to be maintained at project site for quality control comparisons.
- G. Timing of Submittals: Submit submittals in a timely fashion to allow at least 10 business days for each office's review and handling. This means that submittals which have to be reviewed by the Architect and one of their consultants require at least 20 business days for review and handling. Add ten business days for each additional consultant who must review a submission.
- H. Architect's Action on Submittals: Architect will review submittals, stamp with "action stamp", mark action, and return to Contractor. Architect will review submittals only for conformance with the design concept of the project. The Contractor is responsible for confirming compliance with other Contract requirements, including without limitation, performance requirements, field dimensions, fabrication methods, means, methods, techniques, sequences and procedures of construction, coordination with other work. The Architect's review and approval of submittals shall be held to the limitations stated in the Owner/Architect Agreement and the Conditions of the Contract. In no case shall approval or acceptance by the Architect be interpreted as a release of Contractor of their responsibilities to fulfill all of the requirements of the Contract Documents.

- 1. Required Resubmittal: Unless submittal is noted "reviewed" or "reviewed except as noted, resubmission not required," make corrections or changes to original and resubmit to Architect.
- 2. Distribution: When submittal is noted "reviewed" or "reviewed as noted, resubmittal not required," make prints or copies and distribute to Owner, Subcontractors involved, and to all other parties requiring information from the submittal for performance or coordination of related work.

1.12 WARRANTIES

- A. Warranties Required: Refer to individual trade sections for specific product warranty requirements.
- B. Procurement: Where a warranty is required, do not purchase or subcontract for materials or work until it has been determined that parties required to countersign warranties are willing to do so.
- C. Warranty Forms: Submit written warranty to Owner through Architect for approval prior to execution. Furnish two copies of executed warranty to Owner for their records; furnish two additional conformed copies where required for maintenance manual.
- D. Work Covered: Contractor shall remove and replace other work of project which has been damaged as a result of failure of warranteed work or equipment, or which must be removed and replaced to provide access to work under warranty. Unless otherwise specified, warranty shall cover full cost of replacement or repair, and shall not be pro-rated on basis of useful service life.
- E. Warranty Extensions: Work repaired or replaced under warranty shall be warranted until the original warranty expiration date or for ninety days whichever is later in time.
- F. Warranty Effective Starting Date: Guarantee period for all work, material and equipment shall begin on the date of substantial completion, not when subcontractor has completed their work nor when equipment is turned on. In addition to the one year guarantees for the entire work covered by these Contract Documents, refer to the various sections of the specifications for extended guarantee or maintenance requirements for various material and equipment.

1.13 CUTTING AND PATCHING

- A. Limitations: Do not cut and patch any work in a manner that would result in a failure of the work to perform as intended, decreased energy performance, increased maintenance, decreased operational life, or decreased safety.
 - 1. Structural Work: Do not cut structural work or bearing walls without written approval from Architect. Where cutting and patching of structural work is necessary and approved by Architect, perform work in a manner which will not diminish structural capacity nor increase deflection of member. Provide temporary shoring and bracing as necessary. Ensure the safety of people and property at all times.
- B. Cutting and Patching Materials: Use materials identical to materials to be cut and patched. If identical materials are not available or cannot be used, use materials that match existing materials to the greatest extent possible. Provide finished work that will result in equal to or better than existing performance characteristics.
- C. Inspection: Before cutting and patching, examine surfaces and conditions under which work is to be performed and correct unsafe and unsatisfactory conditions prior to proceeding.

- D. Protection: Protect adjacent work from damage. Protect the work from adverse conditions.
- E. Cutting: Cut work using methods least likely to damage adjoining work. Use tools designed for sawing or grinding, not hammering or chopping. Use saws or drills to ensure neat, accurately formed holes to sizes required with minimum disturbance to adjacent work. Temporarily cover openings; maintain weathertightness and safety.
 - 1. Utilities: Locate utilities before cutting. Provide temporary utilities as needed. Cap, valve, or plug and seal ends of abandoned utilities to prevent entrance of moisture or other foreign matter.
- F. Patching: Patch with seams and joints which are durable and not visible. Comply with specified tolerances for similar new work; create true even planes with uniform continuous appearance. Restore finishes of patched areas and, if necessary, extend finish restoration onto adjoining unpatched area to eliminate evidence of patching and refinishing. Repaint entire assemblies, not just patched area. Remove and replace work which has been cut and patched in a visually unsatisfactory manner as determined by the Architect.
- G. Qualifications: Retain experienced and specialized firms, original installers if possible, to perform cutting and patching. Workmen shall be skilled in type of cutting and patching required.

1.14 TEMPORARY FACILITIES AND UTILITIES

- A. Scope of Temporary Work: This article is not intended to limit the scope of temporary work required under the Contract. Provide all temporary facilities and utilities needed.
- B. Permits and Fees: Obtain and pay for all permits, fees and charges related to temporary work.
- C. Codes and Authorities Having Jurisdiction for Temporary Facilities and Utilities: Comply with all requirements of authorities having jurisdiction, codes, utility companies, OSHA, and industry standards including, but not limited to the following:
 - 1. NFPA Code 241, Building Construction and Demolition Operations.
 - 2. ANSI-A10 Series, Safety Requirements for Construction and Demolition.
 - 3. NECA National Joint Guideline NJG-6, Temporary Job Utilities and Services.
 - 4. Electrical Service: NEMA, NECA, and UL.
- D. Field Offices: Provide Contractor's field offices as needed. Keep current copies of all Contract Documents and project paperwork neatly on file at jobsite. Permit Architect's unrestricted use of Contractor's field office facilities including copiers, telephones, plan tables, and other equipment. Furnish, maintain, and pay for light, power, phone, fax, and other field office services.
- E. Shops and Sheds: At Contractor's option, provide shops and sheds for Contractor's use as needed. Locate shops and sheds where acceptable to Owner and authorities having jurisdiction. Prior to completion of construction, temporary storage facilities and surplus stored materials shall be removed from the site.
- F. Equipment and Tools: Provide all equipment including, but not limited to, hoists, lifts, scaffolding, machines, tools and the like, as needed for execution of the work. Provide safe access to all parts of the work.
- G. Snow and Ice: Remove all snow and ice which interferes with work or safety.

- H. Streets, Walks and Grounds: Maintain public and private roads and walks clear of debris caused by construction operations. Repair all damage caused to streets, drives, curbs, sidewalks, fences, poles and similar items where disturbed or damaged by building construction and leave them in as good condition after completion of the work as before operations started.
- I. Protection: Protect nearby property and the public from construction activities. Provide and maintain barricades, warning signs and lights, railings, walkways and similar items. Immediately repair damaged property to its condition before being damaged.
- J. Security: Secure site against unauthorized entry at all times. Provide secure, locked temporary enclosures. Protect the work at all times. Provide watchman service, if necessary, to protect the work.
- K. Signs: No exterior signage is permitted without approval of the Owner and Architect.
- L. Fire Prevention: Take every precaution to prevent fire. Provide and maintain in good operating condition suitable and adequate fire protection equipment and services, and comply with recommendations regarding fire protection made by the representative of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits shall be kept orderly and clean, and all combustible rubbish shall be promptly removed from the site.
- M. Egress: Maintain safe and legal means of egress at all times. At all times, provide at least two separate means of egress.
- N. Mold Control and Remediation During Construction: The Contractor shall protect construction materials and building systems from moisture damage and from conditions which promote mold growth during and after construction. The Contractor shall be responsible for mold remediation and replacement of materials which cannot be successfully remediated in accordance with the following requirements:
 - 1. Materials which become wet prior to installation shall be cleaned, treated and dried in accordance with EPA Guidelines.
 - 2. Materials which exhibit mold growth prior to installation shall not be installed and shall be removed from the site.
 - 3. Materials which exhibit mold growth after installation shall be remediated in accordance with EPA Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water. The Contractor shall engage and pay for a qualified industrial hygienist acceptable to the Owner to determine the cause of the mold growth, and to certify in writing that materials have been successfully remediated. In the event that the industrial hygienist recommends methods of remediation in addition to those in the Guidelines, the Contractor shall also be responsible for the additional remediation. Materials which can not be successfully remediated shall be removed and replaced with new materials at no additional expense to the Owner.
 - 4. Prior to the start of construction, the Contractor shall submit the name of the person in the Contractor's organization responsible for ensuring compliance with these requirements for mold control and remediation.
- O. Existing Mold-Contaminated Materials: In the event that mold-contaminated materials are encountered during remodeling operations, the Contractor shall stop work in that area and notify the Owner and Architect in writing. The Owner will engage and pay for an industrial hygienist to evaluation the situation to advise the Contractor on the proper course of action.

1.15 PRODUCTS AND SUBSTITUTIONS

- A. Specified Products: In all cases in which a manufacturer's name, trade name or other proprietary designation is used in connection with materials or articles to be furnished under this Contract, whether or not the phrase "or equal" is used after such name, the Contractor shall provide the product of the named manufacturers without substitution, unless a written request for a substitution has been submitted by the Contractor and approved in writing by the Architect.
- B. Deviations from Detailed Requirements: If the Contractor proposes to use material which, while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, the Contractor shall inform the Architect in writing of the nature of such deviations at the time the materials is submitted for approval, and shall request written approval of the deviation from the requirements of the Contract Documents.
- C. Approval of Substitutions: In requesting approval of deviations or substitutions, the Contractor shall provide evidence, including, but not limited to manufacturer's data, leading to a reasonable certainty that the proposed substitution or deviation will provide a quality of result at least equal to that attainable if the detailed requirements of the Contract Documents were strictly followed. If, in the opinion of the Architect, the evidence presented by the Contractor does not provide a sufficient basis for such reasonable certainty, the Architect may reject such substitution or deviation without further investigation.
- D. Intent of Contract Documents: The Contract Documents are intended to produce a building of consistent character and quality of design. All components of the building including visible items of mechanical and electrical equipment have been selected to have a coordinated design in relation to the overall appearance of the building. The Architect shall judge the design and appearance of proposed substitutes on the basis of the suitability in relation to the overall design of the Project, as well as for their intrinsic merits. The Architect will not approve as equal to materials specified proposed substitutes which in the Architect's opinion, would be out of character, obtrusive, or otherwise inconsistent with the character or quality of design of the Project. In order to permit coordinated design of color and finishes the Contractor shall furnish the substituted material in any color, finish texture, or pattern which would have been available from the manufacturer originally specified, at no additional cost to the owner.
- E. Additional Costs or Impact: Any additional cost, or any loss or damage arising from the substitution of any material or any method for those originally specified shall be borne by the contractor, notwithstanding approval or acceptance of such substitution by the Owner or the Architect, unless such substitution was made at the written request or direction of the Owner and the Architect. Any decrease in the cost of the substitution shall be returned to the Owner.
- F. Manufacturers: To the greatest degree possible, provide primary materials and products from one manufacturer for each type or kind. Provide secondary materials as recommended by manufacturers of primary materials.
- G. Substitution Requests: Refer to Section 016200 SUBSTITUTION REQUEST FORM. Submit 3 copies. Identify product to be replaced by substitute by reference to specification sections and drawing numbers. Provide Contractor's certification and evidence to prove compliance with Contract Document requirements as acceptable to Architect.
- H. Substitution Conditions: Substitution requests will be returned without action unless one of the following conditions is satisfied. The Contractor shall state which of the following conditions applies to the requested substitution:
 - 1. Request is due to an "or equal" clause.
 - 2. Specified material or product cannot be coordinated with other work.

- 3. Specified material or product is not acceptable to authorities having jurisdiction.
- 4. Substantial advantage is offered Owner in terms of cost, time, or other valuable consideration.
- 5. Specified material or product is not available.
- I. Invalid Substitutions: Contractor's submittal and Architect's acceptance of shop drawings, samples, product data or other submittal is not a valid request for, nor an approval of a substitution unless the Contractor presents the information when first submitted as a Request for Substitution.
- J. Substitution Requests and Sustainable Design Intent:
 - 1. Proposed substitutions may be rejected where data is not provided or where data that is significantly different than specified materials would negatively impact the project's sustainable design intent.
 - 2. Data which impacts sustainable design intent includes, but is not limited to, location of manufacture, recycled content, and indoor air quality.
- K. Compatibility of Materials Used in the Work:
 - 1. Ensure complete compatibility between materials.
 - 2. Compatibility shall include adhesion, erosion, solubility, differential thermal response, and galvanic action.
 - 3. Provide evidence of compatibility.
 - 4. Provide custom testing where evidence is not available.
 - 5. Where materials are not compatible, provide necessary isolation or transition materials and provide details of same.
 - 6. Correct defects resulting from incompatibility including de-construction and re-construction of assemblies whether materials are part of a submittal and substitution process or not.
 - 7. Proposed substitutions may be rejected where compatibility information is not provided; or where compatibility is not adequately addressed, according to the Architect's judgment; or where incompatible materials would negatively impact the project's success.

1.16 DELIVERY, STORAGE AND HANDLING

A. Manufacturer's Instructions: Strictly comply with manufacturer's instructions and recommendations and prevent damage, deterioration and loss, including theft. Minimize long-term storage at the site. Maintain environmental conditions, temperature, ventilation, and humidity within range permitted by manufacturers of materials and products used.

1.17 LABELS

A. Labels, Trademarks, & Tradenames: Locate required labels on inconspicuous surfaces. Do not provide labels, nameplates, or trademarks which are not required. Provide permanent data plate on each item of equipment stating manufacturer, model, serial number, capacity, ratings and all other essential data.

1.18 RECORD DOCUMENTS

A. General: Keep record documents neatly and accurately. Record information as the work progresses and deliver to Architect at time of final acceptance. Include in record documents all field changes made, all relevant dimensions, and all relevant details of the work. Keep record documents up to date with all field orders and change orders clearly indicated.

- B. Drawings: Keep four separate sets of blackline prints at the site, one set each for mechanical, electrical, plumbing, and architectural/structural disciplines. Neatly and accurately note all deviations from the Contract Documents and the exact actual location of the work as installed. Marked-up and colored prints will be used as a guide to determine the progress of the work installed. Requisitions for payment will not be approved until the record documents are accurate and up-to-date.
 - 1. Work Outside Building: Record data outside of building to an accuracy of plus or minus 1 inch and determine and record the invert elevation of all drain lines.
 - 2. At completion of the work, submit one complete set of marked-up prints for review. After acceptance, these marked-up prints shall be used in the preparation of the record drawings.
 - 3. Architect shall furnish Contractor with AutoCAD files for originals of the Contract Drawings. Make modifications to these files as shown on the marked-up prints. Remove superseded data to show the completed installation.
 - 4. Deliver the completed AutoCAD record drawings, in the same version as Contract Drawings, properly titled and dated to the Architect. Indicate preparer of record drawings. These record drawings shall become the property of the Owner.
- C. Specifications: Maintain one clean copy of complete specifications [including addenda, modifications, and bulletins with changes, substitutions, and selected options clearly noted. Circle or otherwise clearly indicate which manufacturer and products are actually used.
- D. Operating and Maintenance Manuals: Manuals shall be submitted which contain the following:
 - 1. Description of the system provided.
 - 2. Handling, storage, and installation instructions.
 - 3. Detailed description of the function of each principal component of the systems or equipment.
 - 4. Operating procedures, including prestartup, startup, normal operation, emergency shutdown, normal shutdown and troubleshooting.
 - 5. Maintenance procedures including lubrication requirements, intervals between lubrication, preventative and repair procedures, and complete spare parts list with cross reference to original equipment manufacturer's part numbers.
 - 6. Control and alarm features including schematic of control systems, control loop electric ladder diagrams, controller operating set points, settings for alarms and shutdown systems, pump curves and fan curves.
 - 7. Safety and environmental considerations.
- E. Copies of Operating and Maintenance Manuals: Three copies of the manuals shall be provided within sufficient time to allow for training of Owner's personnel. Submit one copy of the manuals to the Architect for review no later than 90 calendar days prior to substantial completion, or building turn over, whichever comes first. Submit the remaining five copies within 15 days after first review set is returned to contractor. Progress payment may be withheld if this requirement is not met.
- F. Additional Requirements for Operating and Maintenance Manuals: The requirements for manuals applies to each packaged and field-fabricated operating system. The manuals shall be provided in three-ring side binders with durable plastic covers. The manuals shall contain a detailed table of contents and have tab dividers for major sections and special equipment.
- G. Framed Data: Provide charts and lists of all valves, circuits, switches, controls and equipment. Install on walls under glass at locations directed by Architect.

1.19 PROJECT CLOSE OUT

- A. Complete the following prior to Substantial Completion:
 - 1. Provide Contractor's Punch List of incomplete items stating reason for incompletion and value of incompletion.
 - 2. Advise Owner of insurance change over requirements.
 - 3. Submit all warranties, maintenance contracts, final certificates and similar documents.
 - 4. Obtain Certificate of Occupancy and similar releases which permit the Owner's full and unrestricted use of the areas claimed "Substantially Complete".
 - 5. Submit record documents.
 - 6. Deliver maintenance stocks of materials where specified.
 - 7. Make final change over of lock cylinders or cores and advise Owner of change of security responsibility.
 - 8. Complete startup of all systems and instruct Owner's personnel in proper operation and routine maintenance of systems and equipment.
 - 9. Complete clean up and restoration of damaged finishes.
 - 10. Remove all temporary facilities and utilities that are no longer needed.
 - 11. Request Architect's inspection for Substantial Completion.
- B. Architect will either issue a Certificate of Substantial Completion or notify Contractor of work which must be performed prior to issue of certificate.
- C. Complete the following prior to Final Acceptance and payment:
 - 1. Obtain Certificate of Substantial Completion.
 - 2. Submit final application for payment, showing final accounting of changes in the work.
 - 3. Provide final releases and lien waivers not previously submitted.
 - 4. Submit certified copy of final punch list stating that Contractor has completed or corrected each item.
 - 5. Submit final meter readings, record of stored fuel and similar information.
 - 6. Submit Consent of Surety for final payment.
 - 7. Submit evidence of Contractor's continuing insurance coverage (if required by Contract Documents).

1.20 FINAL CLEANING AND REPAIR

- A. Clean Up: Immediately prior to the Architect's inspection for Substantial Completion, the Contractor shall completely clean the premises and clean and prepare the completed work in order for it to be used for its intended purpose in accordance with the Contract Documents. Such work shall include, but not be limited to the following:
 - 1. Concrete and ceramic surfaces shall be cleaned and washed.
 - 2. Resilient coverings shall be cleaned, waxed and buffed as applicable.
 - 3. Woodwork shall be dusted and cleaned.
 - 4. Sash, fixtures and equipment shall be thoroughly cleaned.
 - 5. Stains, spots, dust, marks and smears shall be removed from all surfaces.
 - 6. Hardware and metal surfaces shall be cleaned and polished.
 - 7. Glass and plastic surfaces shall be thoroughly cleaned by professional window cleaners.
 - 8. Damaged, broken or scratched glass or plastic shall be replaced by the Contractor at the Contractor's expense.
 - 9. Vacuum carpeted and soft surfaces with high efficiency particulate arrestor (HEPA) vacuum.

- 10. Use low-emitting, environmentally friendly cleaning agents and procedures. Do not use ammonia, chlorine bleach, or solvent-based cleaners, unless authorized in writing by Architect.
- B. Repairs: Repair and touch-up all damaged and deteriorated products and surfaces.

PART 2 - PRODUCTS [Not Used]

PART 3 - EXECUTION [Not Used]

UNIT PRICES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. This Section covers those items for which indefinite quantities can be expected and, therefore, pre-agreed prices per unit of work are established as means to determine adjustments to the Contract Price after actual quantities are determined.

1.3 QUANTITIES AND COST ADJUSTMENTS

- A. Refer to individual Specification Sections for methods of measurement and payment for unit prices. As soon as the work involved in each unit cost item has been completed, submit documentation to establish the actual quantities provided. Submit to the Architect for review and issuance of Change Order.
- B. Change Order amount for each unit cost item will be based on actual quantities multiplied by the unit price. This unit price includes all costs as described below.

1.4 UNIT PRICES

- A. Should certain additional work be required, or should the quantities of certain classes of work be increased or decreased from those required by the Contract Documents, by authorization of the Owner, the below unit prices shall, at the option of the Owner, be the basis of payment to the Contractor or credit to the Owner, for such increase or decrease in the work.
- B. The Unit Prices shall represent the exact net amount per unit to be paid the Contractor (in the case of additions or increases) or to be refunded the Owner (in the case of decreases). No additional adjustment will be allowed for materials, installation, substrate preparation, overhead, profit, insurance, general conditions, or other direct or indirect expenses of the Contractor or Subcontractors.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. As defined by the Architect.

John A. Bishop Elementary School Renovation Project Arlington Facilities Department 25 Columbia Road, Arlington, MA 02474 Audrey O'Hagan Architects Project No. 228.00 May 25, 2023

ALTERNATES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. For each of the alternates Scheduled at the end of this Section, state the amount in the proposal to be added to or deducted from the Contract Sum for the work.

1.3 ALTERNATES

- A. Definition: "Alternates" are alternate products, materials, equipment, systems, methods, units of work or major elements of the construction, which may, at the Owner's option and under the terms established by the Contract or Agreement, be selected for the work in lieu of the corresponding requirements of the Contract Documents. Selection may occur prior to the Contract Date, or may, by the Agreement, be deferred for possible selection at a subsequent date.
- B. Alternate Requirements: A Schedule of Alternates is included at the end of this Section. Each alternate is defined using abbreviated language, recognizing that the Contract Documents define the requirements. Coordinate related work to ensure that work affected by each alternate is complete and properly interfaced with work of each selected alternate.
- C. Provide written proposals for each alternate on the Bid Form for Owner's consideration. Each proposal amount shall include the entire cost of the alternate portion of the work including overhead, profit, and other costs including cost of interfacing and coordinating the alternate with related and adjacent work.
- D. Selection of Alternates: Selection of alternates to be included in the work will be by the Owner.
- E. Notification: Immediately following award of Contract, prepare and distribute to each entity a notification of status of each alternate. Indicate which alternates have been accepted, rejected, or deferred for consideration at a later date. Include full description of negotiated modifications to alternates, if any.

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PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

- 3.1 SCHEDULE OF ALTERNATES
 - A. Refer to the Alternates on Drawings A11, A12, A20, and A40.

MOCKUPS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

- A. General: Provide and coordinate mock-up assemblies at Project site for Architect's review and acceptance, in accordance with requirements of the Contract Documents. Refer to individual Specification Sections for mock-up requirements. Generally, without limitation, mock-ups on site include the following:
 - 1. Mock-ups of individual pieces of the work, as specified within individual Specification Section.
- B. It shall be the responsibility of the Contractor to coordinate the work of the related Specification Sections so that each mock-up meets the specified requirements.
- C. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Individual Specification Sections for Submittal Samples.

1.3 DEFINITIONS

- A. Freestanding Mock-Ups: Full-size, physical assemblies that are constructed on-site in a protected location.
 - 1. Freestanding mock-ups are not part of the final construction. Freestanding mock-ups will be used to verify selections made under sample submittals, to demonstrate aesthetic effects, qualities of materials and execution, and to review construction, coordination, testing, and operation.
 - 2. Approved freestanding mock-ups establish the standard by which the Work will be judged.
 - 3. Approved freestanding mock-ups remain on site during the balance of construction and are demolished and removed from site at completion of the Work they represent.

1.4 SUBMITTALS

- A. Schedule: Construction Manager shall submit a schedule of mock-up construction, including dates for mock-up review by the Architect.
 - 1. Mock-up schedule shall be reviewed at each progress meeting, revised and resubmitted as required.

MOCK-UPS

- 2. Schedule shall allow sufficient time for mock-ups which are not accepted to be reconstructed and reviewed until accepted by the Architect.
- B. Shop Drawings of Mock-Ups: Provide large scale shop drawings for fabrication, installation and erection of all parts of each mock-up. Provide plans, elevations, and details of anchorage, connections and accessory items.
- C. Photographs of Mock-Ups: Submit photographs of mock-ups after completion of installation and acceptance of each mock-up.
- D. Submittal Samples: Refer to individual Specification Sections for submittal requirements of mockup components and coordinate accordingly.

1.5 QUALITY ASSURANCE

A. Design Modifications: Make design modifications to work only as required to meet performance requirements and to coordinate the work. Indicate proposed design modifications on shop drawings. Maintain original design concept without altering profiles and alignments indicated.

PART 2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS

A. Provide materials, components, and products for mock-ups as specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 GENERAL

A. Refer to PART 3, EXECUTION portions of the various Specification Sections for specific requirements regarding condition of surfaces, erection, and erection tolerances.

3.2 INDIVIDUAL MOCK-UPS

- A. Provide individual mock-ups of types and sizes required by individual Specification Sections to evaluate and set the standard of quality for that work. Obtain Architect's acceptance of visual qualities prior to commencing work that individual mock-up is intended to represent. Protect and maintain approved mock-ups throughout the work of the Contract. Locate mock-ups at the Project site as directed by the Architect.
 - 1. Provide as many mock-ups as required until Architect's approval has been received.

3.3 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair and restore substrates and finishes.

- 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as non-visible as possible.
- B. Protect construction exposed by or for quality-control service activities.

3.4 REMOVAL AND DISPOSAL

A. Demolish and remove mock-ups from site at the completion of the Project. Legally dispose of demolished mock-up materials. Comply with requirements of Section 017400 – CONSTRUCTION WASTE MANAGEMENT.

John A. Bishop Elementary School Renovation Project Arlington Facilities Department 25 Columbia Road, Arlington, MA 02474 Audrey O'Hagan Architects Project No. 228.00 May 25, 2023

SECTION 016200

SUBSTITUTION REQUEST FORM

No substitutions will be considered without this completed substitution request form and supporting documentation. Substitutions made without completion of this form will be considered defective work as stated in AIA A201.

Date:	Number:	
Re:	Request for Substitution	
The Contractor proposes th Documents:	ne following substitution in accordance with the requirements	of the Contract
Scope of Substitution		
Specification Reference		_
Drawing Reference		
Reason for Proposed Substitution		
Benefit to Owner		_
Impact on Project Cost		_
Impact on Project Schedule		_ _
Impact on Guarantees and Warranties		_ _
Coordination and Compatibility Required with Adjacent Materials and System		_

SUBSTITUTION REQUEST FORM

25 Columbia Road, Arlington, MA 02474

List Deviations
From Specified
Requirements

Attachments: Attach supporting documentation sufficient for Architect to evaluate substitution. Substitution
Request Forms submitted without adequate documentation will be returned without review.

Attachments

Response Date: List date by which response by Architect is requested to maintain project schedule and allow sufficient time for inclusion of proposed substitution.

Response Date

Submitted By
Firm and Address

Signature below signifies acceptance of responsibility for accuracy and completeness of information included in this Substitution Request Form.

Audrey O'Hagan Architects

Project No. 228.00

John A. Bishop Elementary School Renovation Project

Arlington Facilities Department

Authorized Signature

CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. This Section includes requirements for the Contractor's implementation of waste management controls and systems for the duration of the Work.

1.3 INTENT

- A. The Owner and Architect have established that this Project shall generate the least amount of waste practical and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.
- B. With regard to these goals the Contractor shall develop, for the Architect's review, a Construction Waste Management Plan (CWMP) for this Project.
- C. Each Subcontractor shall be responsible for segregating his own waste into different dumpsters as directed by the Contractor.
- D. Contractor shall be responsible for ensuring that debris will be disposed of at appropriately designated licensed solid waste disposal facilities, as defined by MGL Chapter 111, Section 150A.

1.4 SUBMITTALS

- A. Waste Management Plan (WMP): Submit within 14 calendar days after receipt of Notice to Proceed, in a format acceptable to the Owner.
 - 1. Analysis of the proposed jobsite waste to be generated, including types and rough quantities.
 - 2. Landfill Options: The name of the landfills where trash and building debris will be disposed of, the applicable landfill tipping fees, and the projected cost of disposing of all Project waste in the landfills.
 - Landfill Certification: Contractor's statement of verification that landfills proposed for use are licensed for types of waste to be deposited and have sufficient capacity to receive waste from this project.
 - 4. Alternatives to Landfilling: A list of each material proposed to be salvaged or recycled during the course of the Project. Include the following and any additional items proposed:
 - a. Cardboard and paper products.
 - b. Clean dimensional wood. If means of diversion is Wood Derived Fuel (WDF) refer to submittal requirements below.
 - c. Beverage containers.
 - d. Concrete.

- e. Metals from framing, banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
- f. Mechanical and electrical equipment.
- g. Building components which can be removed relatively intact from existing construction.
- h. Packaging materials, including cardboard, boxes, plastic sheet and film, polystyrene packaging, wood crates, plastic pails.
- i. Glass
- j. Scraps from new gypsum wall board.
- k. Carpet and pad.
- I. Acoustical ceiling panels.
- m. Plastics.
- Land clearing debris and vegetation.
- 5. Meetings: A description of the regular meetings to be held to address waste management.
- 6. Materials Handling Procedures: A description of the means by which any waste materials identified above will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.
- 7. Transportation: A description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site) and destination of materials.
- B. Waste Management Progress Reports: Concurrent with each Application for Payment, submit a written Waste Management Progress Report in the same format as required for Final Report.
- C. Waste Management Final Report: Prior to Substantial Completion, submit a written Waste Management Final Report summarizing the types and quantities of materials recycled and disposed of under the Waste Management Plan. Include the name and location of disposal facilities. Quantity may be measured by either weight or volume; be consistent in calculations. Include the following:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste, by weight.
 - 4. Quantity of waste salvaged, both estimated and actual.
 - 5. Quantity of waste recycled, both estimated and actual.
 - 6. Total quantity of waste diverted (salvaged plus recycled).
 - Total quantity of waste diverted (salvaged plus recycled) as a percentage of total waste.

D. Other Submittals:

- 1. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- 2. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- 3. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, and/or receipts.
- 4. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, and/or receipts.
- 5. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and

that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

- E. Commingling Waste Vendor Submittals: Provide annual report from local or state government authority and summary attachment of diverted materials with the average annual recycling rate. Figures in the summary must be derived from the annual reports in concise clear language.
 - 1. Provide tipping invoices for commingled waste and the following:
 - a. Vendor's most recent annual report from local or state government authority.
 - b. Vendor's annual report summary attachment of diverted materials in tonnage, with the average annual recycling rate.

PART 2 - PRODUCTS [Not Used]

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement Waste Management Plan as approved by the Architect. Provide containers, storage, signage, transportation, and other items as required to implement WMP for the entire duration of the Contract.
- B. Commingling Waste: Commingling waste at the job site may be allowed, provided that the following conditions are met:
 - 1. Comminglers shall be included in the Construction Waste Management Plan (CWMP).
 - 2. Additional comminglers must be pre-approved by the Architect via CWMP addenda, prior to tipping on the job site.

3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: The Contractor shall designate an on-site person responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the Project.
- B. Distribution: The Contractor shall distribute copies of the Waste Management Plan to the Job Site Foreman, each Subcontractor, the Owner and the Architect.
- C. Instruction: The Contractor shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.
- D. Separation Facilities: The Contractor shall lay out and label a specific area to facilitate separation of materials for recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials. Location shall be acceptable to the Architect.
 - Waste commingling shall be approved prior to jobsite tipping, per requirements of this Section.

John A. Bishop Elementary School Renovation Project Arlington Facilities Department 25 Columbia Road, Arlington, MA 02474 Audrey O'Hagan Architects Project No. 228.00 May 25, 2023

E. Hazardous Wastes: Any unforeseen hazardous wastes shall be separated, stored, and disposed of according to local regulations and as directed by the Owner.

CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Requirements for minimum indoor air quality (IAQ) performance standards during the construction period and before occupancy.
 - 2. With regard to these goals the Contractor shall develop, for Owner and Architect review, a Construction Indoor Air Quality Management Plan for this Project.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 011000 GENERAL REQUIREMENTS; Submittal requirements.
 - 2. Section 011000 GENERAL REQUIREMENTS; Construction facilities and controls.
 - 3. Section 017400 CONSTRUCTION WASTE MANAGEMENT.
 - 4. Division 23 HVAC.
 - 5. Divisions 02 through 48 Specification Sections; Specific requirements relating to indoor air quality for each Section.

1.3 PERFORMANCE REQUIREMENTS

- A. Prevent exposure of building systems to environmental tobacco smoke during construction. At a minimum, take the following measures:
 - 1. Do not allow smoking in enclosed portions of the project site.
 - a. This prohibition includes electronic cigarettes.
 - 2. Locate exterior designated smoking areas at least 25 feet away from entries, outdoor air intakes and operable windows. Provide signage for designated smoking areas at each entry.
- B. During construction meet or exceed the minimum requirements of the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, Second Edition, November 2007, Chapter 3.
- C. Protect absorptive materials from moisture damage when stored on-site and after installation.
- D. During construction, comply with the following requirements:

- 1. If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used at each return air grille, as determined by ASHRAE 52.2-1999. Replace filtration media immediately prior to occupancy.
- E. After construction ends but before occupancy, comply with one of the following requirements:
 - 1. Perform a building flush-out with outside air.
 - 2. Conduct IAQ testing for air contaminant levels in the building.

1.4 SUBMITTALS

- A. Construction Indoor Air Quality (IAQ) Management Plan: With the completed Form of Bidder's Proposal, the Contractor shall submit a preliminary Construction IAQ Management Plan.
 - 1. Within 21 calendar days after receipt of Notice to Proceed, the Contractor shall submit to the Owner a finalized Construction IAQ Management Plan.
 - 2. The proposed Plan shall comply with Division 23 HVAC requirements.
 - 3. The proposed Plan shall include, but not be limited to, the following:
 - a. Protection of ventilation system components during construction.
 - b. Cleaning and replacing contaminated ventilation system components after construction, including filtration media.
 - c. Temporary ventilation.
 - d. Protection of absorptive materials from moisture damage when stored on-site and after installation, including exterior wall rain protection.
 - e. Sequence of finish installation plan.
 - f. Selection of cleaning products and procedures to be used during construction and final cleaning.
 - g. Other items as required by SMACNA IAQ Guidelines for Occupied Buildings under Construction, Chapter 3.
 - 4. Coordinate Construction IAQ Management Plan with Owner's current IAQ management plans and procedures.
- B. Indoor Air Quality (IAQ) Data: Submit emission test data as required, with testing laboratory and date clearly identified.
- C. Material Safety Data Sheets (MSDS): Submit for materials as required, with date clearly identified. MSDS must contain specific chemical content data identifying the percent of the total product mass represented by each listed chemical.
- D. Product Data: Submit for each type of filtration media used during construction and installed immediately prior to occupancy, with MERV values clearly identified.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Take special care to prevent accumulation of moisture on materials and within packaging during delivery, storage, and handling to prevent development of mold and mildew inside packaging and on products.
- B. Immediately remove from site and properly dispose of materials showing signs of mold and mildew, including materials with moisture stains.

PART 2 - PRODUCTS

2.1 FILTRATION MEDIA

A. Filtration Media: Comply with ASHRAE 52.2-1999 and provide MERV as required.

PART 3 - EXECUTION

3.1 CONSTRUCTION IAQ MANAGEMENT PLAN IMPLEMENTATION

- A. IAQ Manager: The Contractor shall designate an on-site person responsible for instructing workers and overseeing and documenting results of the Construction IAQ Management Plan for the Project.
- B. Distribution: The Contractor shall distribute copies of the Construction IAQ Management Plan to the Job Site Foreman, each subcontractor, the Owner, and the Architect.
- C. Instruction: The Contractor shall provide on-site instruction of appropriate procedures and methods to be used by all parties at the appropriate stages of the Project.
- D. Preconditioning: Allow products, which have odors and significant VOC emissions, to off-gas in a dry, well-ventilated space for sufficient period to dissipate odors and emissions prior to delivery to Project.
 - 1. Remove containers and packaging from materials prior to conditioning to maximize off-gassing of VOCs.
 - 2. Condition products in ventilated warehouse or other building.
- E. Coordinate Construction IAQ Management Plan with final cleaning as indicated in Section 011000, GENERAL REQUIREMENTS.

DEMOLITION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included:

- 1. Demolition and removal of selected portions of buildings and structures and as required for new work. Refer to the Drawings for additional requirements.
- 2. Salvage of existing items to be reused or turned over to the facility.
- 3. Removal and legal disposal of demolished materials off site. Except those items specifically designated to be relocated, reused, or turned over to the facility, all existing removed materials, items, trash and debris shall become property of the Contractor and shall be completely removed from the site and legally disposed of at her/his expense. Salvage value belongs to the Contractor. On-site sale of materials is not permitted.
- 4. Demolition and removal work shall properly prepare for alteration work and new construction to be provided under the Contract.
- 5. Scheduling and sequencing operations without interruption to utilities serving occupied areas. If interruption is required, obtain written permission from the utility company and the Owner. Provide temporary services as necessary to serve occupied and usable facilities when permanent utilities must be interrupted, or schedule interruption when the least amount of inconvenience will result.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 011000 GENERAL REQUIREMENTS for Temporary Facilities And Controls:
 - a. Maintenance of access, cleaning during construction, dust and noise control.
 - 2. Section 017400 CONSTRUCTION WASTE MANAGEMENT:
 - a. Waste management and recycling.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

- B. Remove and Salvage: Detach items from existing construction and deliver them to the Owner ready for reuse, at a location designated by the Owner. Protect from weather until accepted by Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated. Protect from weather until reinstallation.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain property of the Owner as applicable. Carefully remove each item or object in a manner to prevent damage and deliver promptly to a location acceptable to the Owner.

1.5 SUBMITTALS

- A. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with early and late starting and finishing dates for each activity. Ensure Owner's on-site operations are uninterrupted if applicable.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Locations of proposed dust- and noise-control temporary partitions and means of egress, including for other occupants affected by selective demolition operations.
 - 6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
 - 7. Means of protection for items to remain and items in path of waste removal from building.
- B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged, and turned over the Owner.
- C. Predemolition Videotapes: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01. Submit before Work begins.
- D. Landfill Records: Provide trip tickets (receipts) indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
 - Comply with submittal requirements in Section 017400 CONSTRUCTION WASTE MANAGEMENT.

1.6 QUALITY ASSURANCE

A. Examination of Existing Conditions: The Contractor shall examine the Contract Drawings for demolition and removal requirements and provisions for new work. Verify all existing conditions

and dimensions before commencing work. The Contractor shall visit the site and examine the existing conditions as he finds them and shall inform herself/himself of the character, extent and type of demolition and removal work to be performed. Submit any questions regarding the extent and character of the demolition and removal work in the manner and within the time period established for receipt of such questions during the bidding period.

- B. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with ANSI A10.6 and NFPA 241.
- E. Predemolition Conference: Conduct conference at Project site to comply with requirements in Section 011000 GENERAL REQUIREMENTS, Project Meetings. Review methods and procedures related to selective demolition including, but not limited to, the following:
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.7 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (NOT USED)

2.1 SALVAGING

- A. Salvaged for Reinstallation: Materials indicated on the Drawings or designated in the field by the Owner to be salvaged and reinstalled shall be carefully removed and stored at a location acceptable to the Architect and Owner. Materials to be salvaged are listed on the Drawings.
- B. Salvaged for Storage: Materials indicated on the Drawings or designated in the field by the Owner to be salvaged and stored shall be carefully removed and delivered to the Owner at locations determined by Owner. Materials to be salvaged include, but are listed on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

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- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Engage a professional engineer registered in the state that the project is located to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction videotapes.
 - 1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
- G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies and Owner.
 - If services/systems are required to be removed, relocated, or abandoned, before
 proceeding with selective demolition provide temporary services/systems that bypass area
 of selective demolition and that maintain continuity of services/systems to other parts of
 building.
 - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.
 - 4. Prior to commencing cutting work in existing surfaces, take all precautionary measures to assure that mechanical and electrical services to the particular area have been made inactive. Coordinate with Fire Suppression, Plumbing, HVAC, and Electrical subcontractors. Only licensed tradesmen of that particular trade shall disconnect and cap existing mechanical and electrical items that are to be removed, abandoned and/or relocated.
 - 5. If, during the process of cutting work, existing utility lines are encountered which are not indicated on the Drawings, regardless of their condition, immediately report such items to the Architect. Do not proceed with work in such areas until instructions are issued by the Architect. Continue work in other areas.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Section 011000 GENERAL REQUIREMENTS, Temporary Facilities and Controls.
 - Maintain adequate passage to and from all exits at all times. Before any work is done
 which significantly alters access or egress patterns, consult with the Architect and obtain
 approval of code required egress. Under no condition block or interfere with the free flow
 of people at legally required exits, or in any way alter the required condition of such exits.
- B. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.
 - 2. Remove temporary shoring, bracing and structural supports when no longer required.
 - 3. Post warning signs and place barricades as applicable during placement and removal of temporary shoring.
- C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area(s).
 - 1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction. Provide temporary barricades as required to limit access to demolition areas.
 - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
- D. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space

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before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.

- 5. Maintain adequate ventilation when using cutting torches.
- 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
- 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
- 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- 9. Dispose of demolished items and materials promptly. Comply with requirements in Section 017400 CONSTRUCTION WASTE MANAGEMENT.

B. Removed and Salvaged Items:

- 1. Clean salvaged items.
- 2. Pack or crate items after cleaning. Identify contents of containers.
- 3. Store items in a secure area until delivery to Owner.
- 4. Transport items to storage area designated by the Owner.
- 5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

- 1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
- 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
- 3. Protect items from damage during transport and storage.
- 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- E. Items for Re-use and Preservation of Existing Surfaces to Remain:
 - 1. The Contractor shall inspect closely each item specifically designated to be relocated, reused, or turned over to the Owner prior to its removal, and immediately report damages and defects to the Architect and the Owner. The Contractor shall be responsible for any subsequent damage to the same other than latent defects not readily apparent from close inspection, and shall bear responsibility for its repair or same replacement as directed by the Architect, to the satisfaction of the Owner.
 - 2. Unless special surface preparation is specified under other Specification Sections, leave existing surfaces that are to remain in a condition suitable to receive new materials and/or finishes.

3.5 PROTECTION OF PUBLIC AND PROPERTY

A. Provide all measures required by federal, state and municipal laws, regulations, and ordinances for the protection of surrounding property, the public, workmen, and Owner's employees during

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all demolition and removal operations. Measures are to be taken, but not limited to installation of sidewalks, sheds, barricades, fences, warning lights and signs, trash chutes and temporary lighting.

- B. Protect all walks, roads, streets, curbs, pavements, trees and plantings, on and off premises, and bear all costs for correcting such damage as directed by the Architect, and to the satisfaction of the Owner.
- C. Demolition shall be performed in such a manner that will insure the safety of adjacent property. Protect adjacent property from damage and protect persons occupying adjacent property from injuries which might occur from falling debris or other cause and so as not to cause interference with the use of other portions of the building, of adjacent buildings or the free access and safe passage to and from the same.
- D. Every precaution shall be taken to protect against movement or settlement of the building, of adjacent buildings, sidewalks, roads, streets, curbs and pavements. Provide and place at the Contractor's own expense, all necessary bracing and shoring in connection with demolition and removal work.
- E. Remove portions of structures with care by using tools and methods that will not transfer heavy shocks to existing and adjacent building structures, both internal and external of the particular work area.
- F. Provide and maintain in proper condition, suitable fire resistive dust barriers around areas where interior demolition and removal work is in progress. Dust barriers shall prevent the dust migration to adjacent areas. Remove dust barriers upon completion of major demolition and removal in the particular work area.

3.6 DISCOVERY OF HAZARDOUS MATERIALS

- A. If hazardous materials, such as chemicals, asbestos-containing materials, or other hazardous materials are discovered during the course of the work, cease work in affected area only and immediately notify the Architect and the Owner of such discovery. Do not proceed with work in such areas until instructions are issued by the Architect. Continue work in other areas.
- B. If unmarked containers are discovered during the course of the work, cease work in the affected area only and immediately notify the Architect and the Owner of such discovery. Do not proceed with work in such areas until instructions are issued by the Architect. Take immediate precautions to prohibit endangering the containers integrity. Continue work in other areas.

3.7 CUTTING

- A. Perform all cutting of existing surfaces in a manner which will ensure a minimal difference between the cut area and new materials when patched. Use extreme care when cutting existing surfaces containing concealed utility lines which are indicated to remain and bear full responsibility for repairing or replacement of all such utilities that are accidentally damaged.
- B. Provide a flush saw cut edge where pavement, curb and concrete removals abut new construction work or existing surfaces to remain undisturbed.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Comply with requirements of Section 017400 CONSTRUCTION WASTE MANAGEMENT and the following:
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.

3.9 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Premises shall be left in a clean condition and ready to accept alteration work and new construction.

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Wood blocking, cants, and nailers.
 - 2. Plywood backing panels.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 064020 INTERIOR ARCHITECTURAL WOODWORK for interior woodwork not specified in this Section.
 - 2. Section 092110 GYPSUM BOARD ASSEMBLIES for sheet metal backing.

1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
 - 4. Environmental Product Declarations (EPD): For wood products, submit EPDs.
 - 5. Wood Products: Wood products must be certified by the Forest Stewardship Council or USGBC-approved equivalent.
 - 6. Recycled Content: Submit percentages by weight of postconsumer and preconsumer recycled content for products having recycled content.
 - 7. Low-Emitting Materials: Building products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010.

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- a. For wood composite materials, submit test results, including TVOC emissions.
- b. For adhesives and sealants, submit test results, including TVOC emissions and VOC content.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fireretardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- B. Environmental Product Declarations (EPD): Industry-wide EPDs for wood products are available from the American Wood Council and Canadian Wood Council.
- C. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 3. Provide dressed lumber, S4S, unless otherwise indicated.
 - 4. Provide dry lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

D. Plywood Panels:

- 1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
- 2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
- 3. Factory mark panels according to indicated standard.

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. General: For all interior use materials, and where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having

jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 - 1. Treatment shall not promote corrosion of metal fasteners.
 - 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 - 3. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.
 - 4. Product shall not contain creosote, arsenic or pentachlorophenol.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

2.3 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Cants.
 - 3. Nailers.
 - 4. Furring.
 - 5. Grounds.
- B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 15 percent moisture content.

2.4 PANEL PRODUCTS

- A. Miscellaneous Concealed Plywood: Exposure 1 sheathing, span rating to suit framing in each location, and thickness as indicated but not less than 1/2 inch.
- B. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch thick.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

ROUGH CARPENTRY

- 1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Wire, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5; except provide stainless steel complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2, where in contact with pressure-preservative treated wood or when exposed to exterior conditions.

2.6 MISCELLANEOUS MATERIALS

- A. Adhesive, Including Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 - 1. Basis of Design: Henkel Corp.; OSI SF450 Heavy Duty Subfloor Construction Adhesive.
 - 2. Low-Emitting Materials: Provide adhesives in compliance with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 3. VOC Limits: Use adhesives that have a VOC content of 70 g/L or less.
 - 4. Do not use adhesives that contain urea formaldehyde.
 - 5. Methylene chloride and perchloroethylene may not be intentionally added to adhesives.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers,

blocking, grounds, and similar supports to comply with requirements for attaching other construction.

- C. Securely attach carpentry work as indicated and according to applicable codes and the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 - 2. ICC-ES evaluation report for fastener.
- D. Countersink fastener heads on exposed carpentry work and fill holes with wood filler.
- E. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.
- 3.2 WOOD BLOCKING, AND NAILER INSTALLATION
 - A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
 - B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Wood base, trim, wainscot and similar items for painted finish.
 - 2. Wood casework, paneling and screen wood panels.
 - 3. Plastic laminate caswrok.
 - 4. Solid surfacing.
 - 5. Repair and refinishing of existing sliding doors and wood paneling.
 - 6. Slotted channel framing (Unistrut) for ceiling supported items.
 - 7. Shop finishing of interior woodwork.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 061000 ROUGH CARPENTRY for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.3 SUBMITTALS

- A. Product Data: For each type of product specified, including casework hardware and accessories, and finishing materials and processes.
 - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
 - 2. Environmental Product Declarations (EPD): For wood products, submit EPDs.
 - 3. Wood Products: Wood products must be certified by the Forest Stewardship Council or USGBC-approved equivalent.
 - 4. Recycled Content: Submit percentages by weight of postconsumer and preconsumer recycled content for products having recycled content.
 - 5. Low-Emitting Materials: Building products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010.

INTERIOR ARCHITECTURAL WOODWORK

- a. For wood composite materials, submit test results, including TVOC emissions.
- b. For adhesives and sealants, submit test results, including TVOC emissions and VOC content.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - a. Provide schedule of blocking required to support the Work of this Section.
 - 2. Show locations and sizes of cutouts and holes for plumbing fixtures, electrical components and other items installed in architectural woodwork.
 - 3. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

C. Samples for Verification:

- 1. Lumber with or for transparent finish, not less than 5 inches wide by 12 inches long for each species and cut, finished on 1 side and 1 edge.
- 2. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.
 - a. Submit step-type range sample sets of factory finished plywood and factory finished solid wood in size illustrating wood grain and specified finish, including edge banding detail and any veneer or solid edge glue joints.
 - b. Submit one leaf for every 1000 gross square foot of veneer required.
- D. Qualification Data: For Installer and fabricator.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful inservice performance.
- B. Installer Qualifications: Minimum two years experience installing similar woodwork.
- C. Quality Standard: Unless otherwise indicated, comply with AWI/AWMAC/WI's "Architectural Woodwork Standards," latest edition, including errata, for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
- D. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
 - 1. The HVAC systems as specified elsewhere may not provide for humidity controls. The expected ranges of relative humidity are expected to be as high as 55% to a low of uncontrolled during the heating system. Comply with AWS Section 2, Care and Storage.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
 - Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWI/AWMAC/WI's "Architectural Woodwork Standards" for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- C. Environmental Product Declarations (EPD): Industry-wide EPDs for wood products are available from the American Wood Council and Canadian Wood Council.
- D. Wood Veneers and Lumber: Provide AWI Custom Grade materials and workmanship, unless otherwise indicated. For species not listed in the AWS comply with the following:
 - 1. Provide AWI Lumber Grade 1 and AWI Grade A Veneer, book-matched, minimum 6 inch face veneer width. Kiln dry to 6-8 percent moisture content. Components shall be free of defects and sapwood. Match adjacent pieces for color and grain pattern.
 - 2. Single-Source Requirement for Wood Veneers and Solids: Intent is to provide wood which matches as closely as possible throughout the project. Provide wood veneers and solids from the same distributor, and from the same flitches and solids sources to the greatest extent possible.
- E. Wood Species and Cut for Transparent Finish: As indicated on the Drawings.
 - 1. Architect's control samples for transparent finish, veneer grain and figure characteristics are available for review at the office of the Architect.
 - 2. Veneer Matching Requirements:
 - a. Matching Between Adjacent Veneer Leaves: Book match and architectural end match.
 - b. Matching Within Individual Panel Faces: Balance and Center Match.
 - c. Method of Matching Panels: Blueprint-matched panels and components.
- F. Wood Products: Comply with the following:
 - 1. Recycled Content of Medium-Density Fiberboard and Particleboard: Provide products with recycled content.
 - 2. Hardboard: AHA A135.4.
 - 3. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade MD, made with binder containing no added urea formaldehyde.
 - 4. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
 - 5. Softwood Plywood: DOC PS 1, Medium Density Overlay (MDO).
 - 6. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no added urea formaldehyde.
 - a. Resin impregnated paper backs are not permitted. Backs shall be of compatible hardwood species and cut. Contact adhesive is not permitted.

INTERIOR ARCHITECTURAL WOODWORK

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this Article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified.
 - 1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.
 - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - 3. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with performance requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Use the following treatment type:
 - Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
 - 2. Kiln-dry materials before and after treatment to levels required for untreated materials.
- C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
 - 1. Fire-Retardant Fiberboard and Particleboard: Provide five ply construction with crossbands to prevent any ammonia fuming from the core to the face veneers.

2.3 CASEWORK HARDWARE AND ACCESSORIES

- A. General: Provide casework hardware and accessory materials associated with architectural casework, except for items specified in Section 087100 DOOR HARDWARE.
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602,100 degrees of opening, self-closing.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
- D. Catches: Push-in magnetic catches, BHMA A156.9, B03131.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081 or BHMA A156.9, B04102; with shelf brackets, B04112.
- F. Drawer Slides: BHMA A156.9, B05091; side mounted and extending under bottom edge of drawer; full-extension type; epoxy-coated-steel with steel ball-bearings; of the following grades:

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- 1. Box Drawer Slides: Grade 1.
- 2. File Drawer Slides: Grade 1HD-100.
- 3. Pencil Drawer Slides: Grade 2.
- 4. Keyboard Slides: Grade 1.
- 5. Trash Bin Slides: Grade 1HD-100.
- G. Door Locks: BHMA A156.11, E07121.
- H. Drawer Locks: BHMA A156.11, E07041.
- I. Grommets for Cable Passage through Countertops: Molded-plastic grommets and matching plastic caps with slot for wire passage.
- J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Stainless Steel: BHMA 630.
- K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- Installation Adhesives and Wood Glues: Formulations approved for use indicated by adhesive manufacturer.
 - Low-Emitting Materials: Provide adhesives in compliance with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 2. VOC Limits: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Wood Glues: 30 g/L.
 - b. Contact Adhesives: Not permitted on the Project without Architect's prior approval.
 - 3. Do not use adhesives that contain urea formaldehyde.
 - 4. Methylene chloride and perchloroethylene may not be intentionally added to adhesives.

2.5 FABRICATION, GENERAL

- A. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- B. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Casework and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch.
- D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.

2.6 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

- A. Grade: Custom.
- B. Wood Species: Any closed-grain hardwood.
- C. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- D. Assemble casings in plant except where limitations of access to place of installation require field assembly.

2.7 WOOD CASEWORK AND PANELING FOR TRANSPARENT FINISH

- A. Grade: Custom.
- B. AWI Type of Casework Construction: Flush overlay.
- C. Wood Species and Cut for Exposed Surfaces: As specified hereinabove.
 - 1. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
 - 2. Matching of Veneer Leaves: Book match.
 - 3. Vertical Matching of Veneer Leaves: End match.
 - 4. Veneer Matching within Panel Face: Running match.

- 5. Veneer Matching within Room: Provide casework veneers in each room or other space from a single flitch with doors, drawer fronts, and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.
- D. Semiexposed Surfaces: Provide surface materials indicated below:
 - 1. Surfaces Other Than Drawer Bodies: Compatible species to that indicated for exposed surfaces, stained to match.
 - 2. Drawer Sides and Backs: Solid-hardwood lumber, stained to match species indicated for exposed surfaces.
 - 3. Drawer Bottoms: Hardwood plywood.

2.8 PLASTIC-LAMINATE CASEWORK

- A. Grade: Custom.
- B. AWI Type of Casework Construction: Flush overlay.
- C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade HGS.
 - 4. Edges: Grade HGS.
- D. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.
 - a. Edges of Plastic-Laminate Shelves: PVC tape, 0.018-inch minimum thickness, matching laminate in color, pattern, and finish.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.
 - 2. Drawer Sides and Backs: Solid-hardwood lumber.
 - 3. Drawer Bottoms: Hardwood plywood.
- E. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

2.9 SOLID-SURFACING-MATERIAL COUNTERTOPS

- A. Grade: Custom.
- B. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
 - 1. Fabricate tops with shop-applied edges of materials and configuration indicated.
 - 2. Fabricate tops with loose backsplashes for field application.
- C. Drill holes in countertops for plumbing fittings and soap dispensers in shop.

2.10 SHOP FINISHING

- A. General: Comply with AWI/AWMAC/WI's "Architectural Woodwork Standards" for factory finishing.
 - 1. Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces.
- C. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen with sheen measured on 60-degree gloss meter per ASTM D 523:
 - 1. Grade: Same as item to be finished.
 - 2. AWS Finish System 5: Water white conversion varnish.
 - 3. Staining: Match approved sample for color.
 - 4. Wash Coat for Stained Finish: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
 - 5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
 - 6. Sheen: Satin, 30-50 gloss units.
 - 7. Effect: Partially filled pore.
- D. Opaque Finish: Comply with requirements indicated below for grade, finish system, color, effect, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523.
 - 1. Grade: Same as item to be finished.
 - 2. AWS Finish System 5: Conversion varnish.
 - 3. Color: As selected by Architect from manufacturer's full range.
 - 4. Sheen: Satin, 30-50 gloss units.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- G. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 60 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
 - 1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
 - 2. Install wall railings on indicated metal brackets securely fastened to wall framing.
 - 3. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.
- H. Casework: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install casework with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Maintain veneer sequence matching of casework with transparent finish.
 - 3. Attach casework to walls with mechanical fasteners. Do not use adhesives, so that casework may be removed and salvaged in the future.
- I. Countertops: Anchor securely by screwing through corner blocks of base casework or other supports into underside of countertop.
 - 1. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 3. Secure backsplashes to tops with concealed metal brackets at 16 inches and to walls with adhesive.
 - 4. Calk space between backsplash and wall with sealant specified in Section 079200 JOINT SEALANTS.

J. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

THERMAL INSULATION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Mineral wool thermal insulation above the ceiling.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - Section 092110 GYPSUM BOARD ASSEMBLIES for acoustic insulation in gypsum board assemblies.
 - 2. Division 22 PLUMBING for plumbing insulation.
 - 3. Division 23 HEATING, VENTILATING, AND AIR CONDITIONING for mechanical insulation.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store in a dry and secure location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 BLANKET INSULATION, MINERAL-WOOL BLANKET

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Roxul Inc.
 - 2. Isolatek International.
 - 3. Owens Corning; Thermafiber.
- B. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics. GreenGuard certified as formaldehyde free and low chemical emissions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

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3.4 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to, patching existing fireproofing as required by new construction activities.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - Section 078410 PENETRATION FIRESTOPPING for firestopping and firesafing insulation.
 - 2. Section 092110 GYPSUM BOARD ASSEMBLIES for fire-resistance-rated assemblies.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For Installer, manufacturer, and testing agency.
- C. Compatibility and Adhesion Test Reports: From material manufacturer indicating the following:
 - 1. Materials have been tested for bond with substrates.
 - 2. Materials have been verified by material manufacturer to be compatible with substrate primers and coatings.
 - 3. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for proposed fire-resistive materials.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireresistive material manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

- B. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01. Review methods and procedures related to fire-resistive materials including, but not limited to, the following:
 - 1. Review and finalize construction schedule and verify sequencing and coordination requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to Project.

1.6 COORDINATION

A. Sequence and coordinate application of fire-resistive materials with other related work specified in other Sections.

PART 2 - PRODUCTS

2.1 APPLIED FIREPROOFING

A. Patch Kit: Patch existing fireproofing disturbed by construction activities and areas with missing fireproofing in the area of work. Use patching materials and methods per products listed in the UL directory. Areas more than 1 square foot in area will require spray application with patch pump. Comply with manufacturer's recommendations for primers for existing fireproofing, based on testing of existing fireproofing. Verify compatibility with existing fireproofing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.
- B. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, and incompatible primers, paints, and encapsulants.

APPLIED FIREPROOFING

3.3 APPLICATION, GENERAL

A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, and apply, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

3.4 CLEANING, PROTECTING, AND REPAIR

- A. Protect fire-resistive material, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Substantial Completion.
- B. Coordinate application of fire-resistive material with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect fire-resistive material and patch any damaged or removed areas.
- C. Repair or replace work that has not successfully protected substrates.

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 079200 JOINT SEALANTS for standard joint sealers.
 - 2. Division 21 FIRE SUPPRESSION for fire-protection piping penetrations.
 - 3. Division 22 PLUMBING for piping penetrations.
 - 4. Division 23 HEATING, VENTILATING AND AIR CONDITIONING for duct and piping penetrations.
 - 5. Division 26 ELECTRICAL for cable and conduit penetrations.

1.3 COORDINATION

- A. Jobsite conditions of each through-penetration firestop system must meet all details of the UL-Classified System selected. If jobsite conditions do not match any UL-classified systems, contact firestop manufacturer for alternative systems or Engineer Judgment Drawings.
- B. Coordinate work with other trades to assure that penetration-opening sizes are appropriate for penetrant locations.
- C. Verify that the schedule is current at the time of construction, and that each referenced system is suitable for the intended application.

1.4 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls and fire partitions.
 - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. Horizontal assemblies include floors, floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
 - 2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 - 3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping:
 - 1. Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
 - 2. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - a. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems demonstrating no evidence of water leakage when tested according to UL 1479.
 - b. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
- F. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- 1.5 SUBMITTALS
 - A. Product Data: For each type of product indicated.
 - 1. Material Ingredients: For sealants, submit Health Product Declarations (HPD) or Declare product labels.

- 2. Low-Emitting Materials: Building products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario.
 - a. For sealants, submit test results, including TVOC emissions and VOC content.
 - b. For sealants, submit GreenGuard Gold certifications.
- B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
- C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
 - 1. Types of penetrating items.
 - 2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
 - 3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
- D. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Either a firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors" or a firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction of a minimum of five projects with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements.
- B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.

- b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed in the UL "Fire Resistance Directory."
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to the following:
 - 1. Hilti, Inc.
 - 2. BioFireshield; RectorSeal Corporation.
 - 3. Specified Technologies, Inc. (STI).
 - 4. 3M; Fire Protection Products Division.

2.2 FIRESTOPPING MATERIALS

- A. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
 - 4. Methylene chloride and perchloroethylene may not be intentionally added to sealants.
- B. VOC Emissions: Sealants must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario.
- C. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- D. Materials: Provide through-penetration firestop systems containing primary materials and fill materials which are part of the tested assemblies indicated in the approved Through-Penetration Firestop System Schedule submittal. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.
- E. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated

2.3 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

- A. Inspecting Agency: Engage a qualified, independent inspecting agency to inspect throughpenetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.5 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

JOINT SEALANTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Joint sealants and fillers.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 092110 GYPSUM BOARD ASSEMBLIES for sealing perimeter joints of gypsum board partitions to reduce sound transmission.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
 - 1. Material Ingredients: For sealants, submit Health Product Declarations (HPD) or Declare product labels.
 - 2. Low-Emitting Materials: Building products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario.
 - a. For sealants, submit test results, including TVOC emissions and VOC content.
 - b. For sealants, submit GreenGuard Gold certifications.
- B. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

JOINT SEALANTS

- C. Qualification Data: For Installer.
- D. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content:
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
 - 4. Methylene chloride and perchloroethylene may not be intentionally added to sealants.
- C. VOC Emissions: Sealants must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario.

D. Colors of Exposed Joint Sealants: Provide colors as selected by the Architect from manufacturer's full range of standard and custom colors; maximum of five colors, three standard colors and two custom colors.

2.2 JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquidapplied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Elastomeric sealants shall be nonstaining to porous substrates. Provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Interior Acrylic Latex Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Henkel Corp.; Loctite Polyseamseal Acrylic Caulk with Silicone.
 - b. Pecora Corporation; AC-20+.
 - c. Tremco Inc.; Tremflex 834.
 - 2. Extent of Use: Interior non-moving joints.

2.3 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type B (bicellular material with a surface skin) or other type, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide selfadhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or

JOINT SEALANTS

harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include concrete, masonry and unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following metal, glass, porcelain enamel and glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

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- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Solid-core flush wood doors for transparent and opaque finishes.
 - 2. Factory finishing for wood doors with transparent finish.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
 - 4. Glass lites for flush wood doors.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 064020 INTERIOR ARCHITECTURAL WOODWORK for wood door frames.
 - 2. Section 099000 PAINTING AND COATING for field finishing of opaque wood doors.

1.3 SUBMITTALS

- A. Product Data: For each type of product, including the following:
 - 1. Door core and edge construction, face type, louvers, and trim for openings.
 - 2. Factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:
 - Door schedule indicating door and frame location, type, size, fire protection rating, and swing.
 - Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
 - 3. Details of frame for each frame type, including dimensions and profile.
 - 4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 - 5. Dimensions and locations of blocking for hardware attachment.
 - 6. Dimensions and locations of mortises and holes for hardware.
 - 7. Clearances and undercuts.
 - 8. Indicate Requirements for veneer matching.
 - 9. Doors to be factory primed or finished and application requirements.

C. Samples for Verification:

- Factory finishes applied to actual door face materials, approximately 8 by 10 inches for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of finish color, sheen, and grain to be expected in finished work
- 2. Frames for light openings, 6 inches long, for each material, type, and finish required.
- D. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with AWI/AWMAC/WI's "Architectural Woodwork Standards," current edition.
- C. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."
 - 1. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.
- D. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 - 2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
- E. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.
- 1.5 DELIVERY, STORAGE, AND HANDLING
 - A. Comply with requirements of referenced standard and manufacturer's written instructions.
 - B. Package doors individually in plastic bags or cardboard cartons.
 - C. Mark each door on top rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and

maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 2. Warranty shall include hardware installation and replacement of glass and glazing.
 - 3. Warranty shall be in effect during the following period of time from date of Substantial Completion:
 - a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 SUSTAINABLE DESIGN PERFORMANCE REQUIREMENTS

- A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
 - 1. Salvaged and reclaimed wood is excluded from certified wood requirements.
- B. Low-Emitting Materials: Provide wood doors in compliance with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Lambton Doors; EnviroDesign Series.
 - 2. Masonite Architectural; Aspiro and Graham Series (formerly Algoma and Marshfield). Cendura Series is not acceptable.
 - 3. Oregon Doors; Architectural Series.
 - 4. VT Industries Inc.; Eggers and Heritage collections.

2.3 DOOR CONSTRUCTION, GENERAL

- A. Doors for Transparent Finish:
 - 1. Grade: AWI Premium, with AWI Grade AA faces, 4 inch veneer width.
 - 2. Species and Cut: As indicated on the Drawings.
 - 3. Match between Veneer Leaves: Book match.
 - 4. Assembly of Veneer Leaves on Door Faces: Center-balance.
 - 5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.

- 6. Stiles: Same species as face.
- 7. Cross-Banding: 1/8 in. high density fiberboard, no added formaldehyde (NAF).
- 8. Adhesives: WDMA T.M.-6, Type I.

B. Doors for Opaque Finish:

- 1. Grade: Premium.
- 2. Faces for Interior Doors: Either medium-density overlay (MDO) or high-density fiberboard (HDF).
- 3. Stiles: Match face.
- 4. Cross-Banding: 1/8 in. high density fiberboard, no added formaldehyde (NAF).
- 5. Adhesives: WDMA T.M.-6, Type I.
- 6. Factory Primer: Manufacturer's standard water-based low VOC primer.

2.4 SOLID-CORE DOORS

- A. Cores: Comply with the following requirements:
 - Composite Wood, General: CARB II compliant or made with binder containing no added formaldehyde (NAF).
 - 2. Structural Composite Lumber Core: WDMA I.S.10, Timberstrand LSL.
 - 3. Provide doors with structural composite lumber cores instead of particleboard cores at locations where exit devices are indicated or where light or louver cutouts exceed 40% of the door area.

B. Interior Veneer-Faced Doors:

1. Construction: Five plies, hot-pressed, with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

C. Fire-Rated Doors:

- 1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
 - a. Fire Retardant Mineral Core, with no added formaldehyde cross-banding.
- 2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as needed to eliminate throughbolting hardware.
- 3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.
 - a. Screw-Holding Capability: 550 lbf per WDMA T.M.-10.
- 4. Pairs: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals.

2.5 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
 - 1. Wood Species: Same species as door faces.
 - 2. Profile: Manufacturer's standard shape.
 - 3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.
- B. Wood-Veneered Beads for Light Openings in Fire Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire rating indicated. Include concealed metal glazing clips where required for opening size and fire rating indicated.

2.6 GLAZING SYSTEMS

A. Glazing: Provide factory installed glass products; minimum 1/4 inch tempered glass.

2.7 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
 - 1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA/DHI A115-W series standards, and hardware templates.
 - Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining. Drill pilot holes for screws for butt hinges and lock fronts at the factory.
 - 2. Metal Astragals: Factory prime and premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors to receive concealed vertical rod exit devices.
- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
 - 1. Fabricate door and transom panels with full-width, solid-lumber meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal doorframes.
- D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Louvers: Factory install louvers in prepared openings.
 - 3. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 GLAZING.

2.8 FACTORY FINISHING

- A. General: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated" for factory finishing.
- B. Doors for Opaque Finish: Factory prime faces and edges of doors, including cutouts, with one coat of wood primer specified in Section 099000 PAINTING AND COATING.
- C. Doors for Transparent Finish: Factory finish doors that are indicated to receive transparent finish. Finish faces and edges of doors, including cutouts.
- D. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: AWS System-9, UV Curable, Acrylated Epoxy, Polyester or Urethane.
 - 3. Staining: Provide water-based stain, custom color as selected by Architect.
 - 4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 DOOR HARDWARE.
- B. Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
 - 2. Install smoke- and draft-control doors according to NFPA 105.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. aRepair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

- C. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- D. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Protection: Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protections and reclean as necessary immediately before final acceptance.
- C. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Access doors and frames for walls and ceilings.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - Section 087100 DOOR HARDWARE for rim cylinder locks and master keying.

1.3 SUBMITTALS

- A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.
- D. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.
- E. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain[each type of access door and frame through one source from a single manufacturer.
- B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. NFPA 252 for vertical access doors and frames.

- 2. ASTM E 119 for horizontal access doors and frames.
- C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

- 2.1 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS
 - A. Basis-of-Design, Typical: Bauco Access Panel Butterfly Style.
 - B. Flush Access Doors and Trimless Frames: Fabricated from steel sheet at typical areas and from stainless-steel sheet at toilet and wet areas.
 - 1. Locations: Wall and ceiling surfaces.
 - 2. Door: Minimum 0.060-inch-thick sheet metal, set flush with surrounding finish surfaces.
 - 3. Frame: Minimum 0.060-inch-thick sheet metal with drywall bead flange.
 - 4. Hinges: Continuous piano.
 - 5. Lock: Cylinder.
 - a. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100, DOOR HARDWARE.
 - C. Recessed Access Doors and Trimless Frames: Fabricated from steel sheet at typical areas and from stainless-steel sheet at toilet and wet areas.
 - 1. Locations: Wall and ceiling surfaces.
 - 2. Door: Minimum 0.060-inch-thick sheet metal in the form of a pan recessed 5/8 inch for gypsum board infill.
 - 3. Frame: Minimum 0.060-inch-thick sheet metal with drywall bead for gypsum board surfaces.
 - 4. Hinges: Concealed pivoting rod hinge.
 - 5. Lock: Cylinder.
 - Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100, DOOR HARDWARE.
 - D. Fire Rated, Uninsulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from steel at typical areas and from stainless-steel sheet at toilets and wet areas.
 - 1. Locations: Wall surfaces.
 - 2. Fire-Resistance Rating: Not less than that of adjacent construction.
 - 3. Door: Minimum 0.060-inch-thick sheet metal, flush construction.
 - 4. Frame: Minimum 0.060-inch-thick sheet metal with 1-inch-wide, surface-mounted trim.
 - 5. Hinges: Continuous piano.
 - 6. Automatic Closer: Spring type.
 - 7. Lock: Self-latching device with cylinder lock.

a. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100, DOOR HARDWARE

2.2 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
 - 1. For trimless frames with drywall bead, provide edge trim for gypsum board and gypsum base securely attached to perimeter of frames.
 - 2. For trimless frames with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
 - 3. Provide mounting holes in frames for attachment of units to metal or wood framing.
 - 4. Provide mounting holes in frame for attachment of masonry anchors.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
 - 1. For recessed doors with plaster infill, provide self-furring expanded metal lath attached to door panel.
- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 - 1. For cylinder lock, furnish two keys per lock and key all locks alike.
 - 2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

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B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

PASS-THRU WINDOWS

PART 1GENERAL

- 1.1 SECTION INCLUDES
- A. Flush-mount pass-thru windows.
- 1.2 RELATED SECTIONS
- A. Section 079200 Joint Sealants.
- 1.3 SUBMITTALS
- A. Comply with Section 011000 Submittal Procedures.
- B. Product Data: Submit manufacturer's product data, including materials, components, fabrication, finish, and installation instructions.
- C. Shop Drawings: Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating dimensions, tolerances, materials, fabrication, glazing, fasteners, hardware, finish, options, and accessories.
- D. Samples: Submit manufacturer's samples of standard finishes.
- E. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- F. Manufacturer's Project References: Submit list of successfully completed pass-thru window projects, including project name and location, and type and quantity of pass-thru windows installed.
- G. Operation and Maintenance Manual: Submit manufacturer's operation and maintenance manual, including operation, maintenance, adjustment, and cleaning instructions, trouble shooting guide, and parts list.
- H. Warranty: Submit manufacturer's standard warranty.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Minimum of 25 years successful experience continuously manufacturing pass-thru windows.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
- C. Handling: Protect materials and finish from damage during handling and installation.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Ready Access, Inc., 1815 Arthur Drive, West Chicago, Illinois 60185. Toll Free (800) 621-5045. Phone (630) 876-7766. Fax (630) 876-7767. Web Site www.ready-access.com. E-Mail ready@ready-access.com.

2.2 FLUSH-MOUNT PASS-THRU WINDOWS

- A. Flush-Mount Pass-Thru Windows: 275 Single Panel Manual Open/Self-Closing Slider Window.
- 1. Service Opening: See Drawings
- 2. Door Operation:
- a. Open: Manual.
- b. Close: Self-closing.
- 3. Door Type: Sliding, 1 door panel.
- 4. Opening Direction: Left to right. Customer View Outside
- 5. Frame: Extruded aluminum, ASTM B 221, Alloy 6063-T6 and 6063-T52.
- 6. Aluminum Sheet: ASTM B 209, Alloy 5005-AQ-H34.
- 7. Galvanized Steel Sheet: ASTM A 653, G90.
- 8. Bottom Sill: On Solid Surface. See Drawings
- 9. Security: Automatically locks each time door closes.
- 10. Security Lock: Aluminum bar extrusion with sliding spring-loaded locking clip.
- 11. Fasteners: Stainless steel rivets and hex-head zinc-plated self-threading machine screws.
- 12. Handle: Black Delrin handle with pressed-in stainless steel spring pins. Stainless steel handle mounting bracket. Stainless steel spring-loaded mounting base.
- 13. Glazing: 1/4-inch tempered glass, ASTM C 1048, clear
- 14. Silicone Glazing Sealant: Dow Corning 999A, aluminum.
- B. U.S. Bullet Proofing, 16201 Branch Court, Upper Marlboro, MD 20774.Phone: (202)875-8562 Fax: (301)218-7925 .Web Site: www.usbulletproofing.com E-Mail info@usbulletproofing.com
- 15 Re: See Items Above.

2.3 FABRICATION

- Assembly: Factory assembled, factory glazed.
- 2.4 ALUMINUM FINISH
- A Powder Coat Painted:
- 1. Color: Match existing door frames.
- System: Heated phosphate-cleaned, electrostatic powder-coated, infrared oven-cured.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive pass-thru windows. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.
- 3.2 PREPARATION

- A. Ensure openings to receive pass-thru windows are plumb, level, square, accurately aligned, correctly located, and in tolerance.
- 3.3 INSTALLATION
- A. Install pass-thru windows in accordance with manufacturer's instructions.
- B. Install pass-thru windows plumb, level, square, true to line, and without warp or rack.
- C. Install pass-thru window components weathertight.
- D. Anchor pass-thru windows securely in place to supports. Use attachment methods permitting adjustment for construction tolerances, irregularities, alignment, and expansion and contraction.
- E. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by Architect.
- F. Sheet Metal Flashing: Install sheet metal flashing as specified in Section 07620 (07 62 00).
- G. Joint Sealants: Install joint sealants as specified in Section 07920 (07 92 00).
- H. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- Remove and replace damaged components that cannot be successfully repaired as determined by Architect.
- 3.4 ADJUSTING
- A. Adjust doors to be weathertight in closed position.
- B. Adjust doors and operating hardware to function properly and for smooth operation without binding.
- 3.5 CLEANING
- Clean pass-thru windows promptly after installation in accordance with manufacturer's instructions.
- B. Remove excess joint sealant in accordance with sealant manufacturer's instructions.
- C. Do not use harsh cleaning materials or methods that would damage glazing or finish.
- 3.6 PROTECTION
- A. Protect installed pass-thru windows to ensure that, except for normal weathering, pass-thru windows will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 088000

GLAZING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Glass and glazing for the following products and applications:
 - Steel doors, frames and sidelights specified in Section 081110 HOLLOW METAL DOORS AND FRAMES.
 - b. Interior borrowed lites.
 - c. Unframed mirrors.
 - d. Glazing film.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 081400 FLUSH WOOD DOORS for factory glazing for wood doors.
 - 2. Section 102800 TOILET ACCESSORIES for metal framed mirror units.

1.3 DEFINITIONS

- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

1.4 PERFORMANCE REQUIREMENTS

A. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than

thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

1.5 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For the following products, in the form of 12-inch- square Samples for glass.
 - 1. Each type of spandrel, patterned, and frosted glass.
 - 2. For each color (except black) of exposed glazing sealant indicated.
 - 3. For each pattern, color, and type of glazing film.
- C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- E. Qualification Data: For installers.
- F. Product Test Reports: For each of the following types of glazing products:
 - 1. Glazing sealants.
 - 2. Glazing gaskets.
- G. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance..
- B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass.
- C. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- D. Safety Glazing Products: Comply with testing requirements in 16 CFR 120.
 - 1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency] acceptable to authorities having jurisdiction.
 - 2. Where glazing units, including Kind FT glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one

- side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.
- 3. Do not use wired glass.
- E. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA "Glazing Manual."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Ultraclear Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I, complying with other requirements specified and with visible light transmission not less than 91 percent and solar heat gain coefficient not less than 0.87.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. AFG Industries, Inc.; Krystal Klear.
 - b. Guardian Industries Corp.; Ultrawhite.
 - c. Pilkington North America; Optiwhite.
 - d. PPG Industries, Inc.; Starphire.
- C. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 - 2. For uncoated glass, comply with requirements for Condition A.
 - 3. For coated vision glass, comply with requirements for Condition C (other coated glass).
- D. Tempered Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; Kind FT; 1/4 inch thick unless indicated otherwise.
- E. Patterned Glass: ASTM C 1036, Type II (patterned and wired flat glass), Class 1 (clear), Form 3 (patterned); and of quality, finish, and pattern specified. Provide as indicated on the Finish Schedule.
 - 1. Frosted Glass: Provide sandblasted finish to match Architect's sample.

- F. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B, Type I, Quality-Q3, and complying with other requirements specified.
 - 1. Glass: Clear float.
 - 2. Custom Coating Color: Match Architect's sample.
- G. Silicone-Coated Spandrel Glass: ASTM C 1048, Condition C, Type I, Quality-Q3, and complying with other requirements specified.
 - 1. Products: Subject to compliance with requirements, provide ICD High Performance Coatings, Opaci-Coat 300; color as selected by Architect from manufacturer's full range.
 - 2. Custom Coating Color: Match Architect's sample.
- H. Glass Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.
 - 1. Mirror Edge Treatment: Flat polished edge.
- I. Glazing Film: Translucent, dimensionally stable, cast PVC film, 2-mil-minimum thickness, with pressure-sensitive, clear adhesive back for adhering to glass and releasable protective backing.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturer's that may be incorporated into the Work include, but are not limited to, the following:
 - a. Avery Dennison, Graphics.
 - b. FDC Graphic Films, Inc.
 - c. Madico, Inc.
 - d. 3M Scotchcal.
 - 2. Comply with requirements for safety glazing.
 - 3. Use: Suitable for exterior and interior applications.
 - 4. Patterns: As selected by Architect from manufacturer's full range.

2.2 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 - Compatibility: Verify glazing sealants that are compatible with one another and with other
 materials they will contact, including glass products, seals of insulating-glass units, and
 glazing channel substrates, under conditions of service and application, as demonstrated
 by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
 - 4. Adhesives and sealants that are used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Structural Glazing Adhesives: 100 g/L.

- b. Architectural Sealants: 250 g/L.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
 - 1. Single-Component Neutral- and Basic-Curing Silicone Glazing Sealants:
 - a. Dow Corning Corporation; 790.
 - b. GE Silicones; SilPruf LM SCS2700.
 - c. Tremco Inc.; Spectrem 1.

2.3 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for project conditions.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 - 1. Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.4 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

G. Mirror Hardware, Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.

2.5 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Wall-Mounted Mirrors: Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
- K. Glazing Film: Apply squarely aligned to glass edges, uniformly smooth, and free from tears, air bubbles, wrinkles, and rough edges, in single sheet completely overlaying the back face of clean glass, according to manufacturer's written instructions, including surface preparation and application temperature limitations.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.6 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION

SECTION 092110

GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Interior gypsum wallboard.
 - 2. Acoustic insulation in gypsum wallboard assemblies.
 - 3. Non-load-bearing steel framing.
 - 4. Installation of access panels.
 - 5. Marking and identification for fire- and smoke-partitions.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - Section 083110 ACCESS DOORS AND FRAMES for installation in gypsum board assemblies.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide fire stop tracks capable of withstanding deflection within limits and under conditions indicated.
 - 1. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure.
- B. Marking and Identification for Fire- and Smoke-Partitions: Fire walls, fire barriers, fire partitions, smoke barriers, smoke partitions and other walls required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:
 - 1. Be located in accessible concealed floor, floor-ceiling or attic spaces; and
 - 2. Locate within 15 feet of end of each wall and repeat at intervals not exceeding 30 feet measured horizontally along the wall or partition; and
 - 3. Include lettering not less than 3 inches in height with a minimum 3/8 inch stroke in contrasting color, incorporating the suggested wording: "FIRE AND/OR SMOKE BARRIER PROTECT ALL OPENINGS," or other wording.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Environmental Product Declarations (EPD): For gypsum board and metal framing, submit EPDs.
 - 2. Material Ingredients: For gypsum boards and acoustical insulation, submit Health Product Declarations (HPD) or Declare product labels.
 - 3. Low-Emitting Materials: Building products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010.
 - For adhesives and sealants, submit test results, including TVOC emissions and VOC content.
 - b. For gypsum board, acoustic insulation, and joint compounds, submit GreenGuard Gold certification.
- B. Shop Drawings: If materials and systems other than those specified and those indicated on the Drawings are proposed for use, submit shop drawings signed and sealed by a structural engineer licensed in the jurisdiction of the project certifying proposed systems meet code requirements, project requirements and the following deflection criteria:
 - For gypsum board assemblies without applied rigid finishes L/240; for gypsum board assemblies with applied rigid finishes such as tile, stone, wood paneling L/360. Lateral load 5 psf except at shafts. Lateral load at shafts shall be required based on analysis of equipment and systems using shaft.
- C. Samples: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.5 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.

4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
 - 2. Protective Coating: Manufacturer's standard corrosion-resistant zinc coating, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch-diameter wire.
- B. Hanger Attachments to Concrete:
 - Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Postinstalled, expansion anchor.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.

- D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch-wide flanges with depth as required for span and loading and indicated on Drawings.
- E. Furring Channels (Furring Members): 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
- F. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. Chicago Metallic Corporation; Drywall Furring System.
 - c. USG Corporation; Drywall Suspension System.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - Marino\WARE.
 - 2. Studco Building Systems.
- B. Steel Studs and Runners: ASTM C 645.
 - 1. Minimum Base-Metal Thickness: 0.0312 inch.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 - 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 - 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Brady Innovations; Sliptrack Systems.
 - 2) California Expanded Metals Co. (CEMCO); CST Slotted Tracks.
 - 3) Clark Dietrich Building Systems; MaxTrak Slotted Deflection Track.
 - 4) Steel Network Inc. (The); VertiTrack VT Series.

- D. Fire Stop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness compatible with studs and in width to accommodate depth of studs.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. California Expanded Metals Co. (CEMCO); SLP-TRK Slotted Tracks.
 - b. Clark Dietrich Building Systems; BlazeFrame Fire Stop Deflection Track.
 - c. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
 - d. Metal-Lite, Inc.; The System Slotted Track.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base-Metal Thickness: 0.0312 inch (20 gauge).
- F. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges.
 - 1. Depth: 1-1/2 inches.
 - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.
- G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Minimum Base-Metal Thickness: 0.0312 inch (20 gauge).
 - 2. Depth: 1-1/2 inches.
- H. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.
 - 1. Configuration: Asymmetrical or hat shaped.
 - 2. Minimum Base-Metal Thickness: 0.0179 inch (25 gauge).
- I. Resilient Sound Isolation Clips: Provide galvanized steel and resilient material sound-isolation clips, equal to the following:
 - 1. Kinetics Noise Control Co.; IsoMax.
 - 2. PAC International, Inc.; RSIC-1.
 - 3. Pliteq, Inc.; GenieClip.
 - Studco Building Systems; Resilmount A237R.
- J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches wall attachment flange of 7/8 inch, minimum bare-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.
- K. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- L. Isolation Strip at Exterior Walls: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

2.4 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. CertainTeed Gypsum, Inc.
 - 2. National Gypsum Company.
 - 3. United States Gypsum Company (USG).
- B. Gypsum Wallboard: ASTM C 1396.
 - 1. Basis of Design: USG; SHEETROCK EcoSmart Panels.
 - a. Environmental Product Declarations (EPD): Type III EPD.
 - b. Low-Emitting Materials: GreenGuard Gold certification.
 - 2. Thickness: 1/2 inch.
 - 3. Long Edges: Tapered.
- C. Gypsum Wallboard, Fire-Resistant Type X: ASTM C 1396.
 - 1. Basis of Design: USG; SHEETROCK EcoSmart Panels Firecode X.
 - a. Environmental Product Declarations (EPD): Type III EPD.
 - b. Low-Emitting Materials: GreenGuard Gold certification.
 - 2. Thickness: 5/8 inch.
 - 3. Long Edges: Tapered.
- D. Moisture- and Mold-Resistant Gypsum Board at Toilet Room: ASTM C 1396. With moisture- and mold-resistant core and paper surfaces.
 - 1. Basis of Design: USG; SHEETROCK EcoSmart Mold Tough Firecode X.
 - a. Environmental Product Declarations (EPD): Type III EPD.
 - b. Low-Emitting Materials: GreenGuard Gold certification.
 - 2. Core: 5/8 inch, Type X.
 - 3. Long Edges: Tapered.
 - 4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 - 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. Expansion (control) joint.

- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
 - 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
 - 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Wallboard: Paper.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Basis of Design: Henkel; OSI F38 Drywall and Panel Adhesive.
 - 2. Provide adhesives in compliance with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 3. VOC Content: 50 g/L or less.
 - 4. Methylene chloride and perchloroethylene may not be intentionally added to adhesives.
 - 5. Do not use adhesives that contain urea formaldehyde.
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

- Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
- D. Acoustic Insulation, Sound Attenuation (Batts) Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corporation; NoiseReducer.
 - b. Johns Manville; Unfaced Formaldehyde-Free Fiber Glass Insulation.
 - c. Knauf Insulation; EcoBatt
 - d. Owens Corning; EcoTouch.
 - e. Owens Corning; Thermafiber SAFB FF.
 - f. Rockwool (formerly Roxul); AFB evo.
 - 2. Recycled Content: Use minimum recycled content of 25%.
 - 3. Low-Emitting Materials, General Emissions Evaluation: GreenGuard Gold certification.
 - 4. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Sealant: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, joint sealant, recommended for sealing interior concealed joints to reduce airborne sound transmission.
 - 1. Available Products, for Concealed and Exposed Joints: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
 - b. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
 - c. USG; SHEETROCK Acoustical Sealant.
 - 2. Available Products, for Concealed Joints Only: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. OSI (a division of Henkel); Pro-Series SC-175.
 - b. Pecora Corp.; BA-98.
 - c. Tremco, Inc.; Tremco Acoustical/Curtainwall Sealant.
 - 3. Provide sealants in compliance with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 4. VOC Content: 250 g/L or less.
 - 5. Methylene chloride and perchloroethylene may not be intentionally added to sealants.

2.8 IDENTIFICATION LABELS FOR FIRE- AND SMOKE-PARTITIONS

- A. Identification Labels: Vinyl adhesive signs, to comply with applicable local Code.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fire Wall Signs, Inc.
 - b. My Safety Sign.
 - c. Safety Supply Warehouse.
 - 2. Text: "FIRE AND SMOKE BARRIER PROTECT ALL OPENINGS"

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
 - After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fireresistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754. Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 5. Do not attach hangers to steel roof deck.
 - 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within [1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on doorframes; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb, unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- D. Direct Furring: Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- E. Z-Furring Members:

- 1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches o.c.
- 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

3.6 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3.7 APPLYING INTERIOR GYPSUM BOARD

- A. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.

- 2. On partitions/walls, apply gypsum panels to minimize end joints.
- 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
- 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. Multilayer Application:

- On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
- 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
- On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
- 4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.8 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners, unless otherwise indicated.
 - 2. LC-Bead: Use at exposed panel edges.
- D. Aluminum Trim: Install in locations indicated on Drawings.

3.9 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below:
 - 1. Level 1: Ceiling plenum areas and concealed areas not exposed to view.
 - 2. Level 4: Panel surfaces that will be exposed to view (typical panels).

3.10 INSTALLING IDENTIFICATION FOR FIRE- AND SMOKE-PARTITIONS

A. Marking and Identification for Fire- and Smoke-Partitions: Permanently install as required by Code.

3.11 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, or exhibit mold growth. Repair of damaged panels in place is not acceptable.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 095100

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Acoustical ceiling tiles and panels.
 - 2. Suspension systems, grid systems and ceiling hangers.
 - 3. Acoustical sealant at edge moldings at acoustical ceilings.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 092110 GYPSUM BOARD ASSEMBLIES for gypsum board ceilings and soffits.
 - 2. Section 095470 STRETCHED FABRIC CEILINGS.
 - 3. Division 21 FIRE SUPPRESSION for fire-suppression components located in ceilings.
 - 4. Division 23 HEATING, VENTILATING AND AIR CONDITIONING for air handling and distribution components located in ceilings.
 - 5. Division 26 ELECTRICAL for light fixture and alarm system components located in ceilings.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. For acoustical ceilings, include Environmental Product Declarations (EPD), recycled content, Health Product Declarations (HPD), Declare labels, and GreenGuard Gold certifications.
 - 2. For sealants, include chemical and VOC content.
- B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension members.
 - 2. Method of attaching hangers to building structure. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.

- 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- 4. Minimum Drawing Scale: 1/4 inch = 1 foot.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6 inch square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12 inch long Samples of each type, finish, and color.
- D. Asbestos Certification: Manufacturer's written certification that acoustical ceiling products contain no asbestos (0.0000%). Product labels indicating that it is the user's responsibility to test the products for asbestos are unacceptable and sufficient cause for rejection of the product on site.
- E. Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. Acoustical Ceiling Panels: Obtain each type through one source from a single manufacturer.
 - 2. Suspension Systems: Obtain each type through one source from a single manufacturer.
- B. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
 - b. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 2. Surface-Burning Characteristics: Provide acoustical panels complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
- D. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 SUSTAINABLE DESIGN PERFORMANCE REQUIREMENTS

A. Chemical Content: Products shall be free of highly fluorinated chemicals (i.e. stain and water repellants), antimicrobials, chemical flame retardants, bisphenols and phthalates, organic solvents, and heavy metals.

2.2 manufacturers

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Armstrong Ceilings.
 - 2. CertainTeed Ceilings.
 - 3. USG.

2.3 ACOUSTICAL PANELS, GENERAL

- A. Acoustic Panel Types: Armstrong Woodworks; Refer to Finish Schedule.
 - 1. Material Ingredients: Provide acoustic ceilings with Cradle to Cradle (C2C) certifications, Health Product Declarations (HPD), or Declare (LBC compliant) product labels.

2. Low-Emitting Materials: Provide acoustic ceilings that are tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010.

2.4 METAL SUSPENSION SYSTEMS

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
 - 1. Structural Classification: Intermediate-duty system.
 - 2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
 - 3. Face Design: Flat, flush.
 - 4. Cap Material: Steel or aluminum cold-rolled sheet.
 - 5. Color: White, prefinished.
 - 6. Grid Face Width: As specified with ACT type.
- B. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.
 - Anchors in Concrete: Anchors with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency; zinc-plated for Class SC1 service.
 - 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106 diameter wire.
- D. Hold-Down Clips: At vestibules and areas subject to wind uplift, provide manufacturer's standard hold-down clips spaced 24 inches on all cross tees.

2.5 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
 - 1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

- 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- 3. For narrow-face suspension systems, provide suspension system and manufacturer's standard edge moldings that match width and configuration of exposed runners.
- B. Suspension Trim: Subject to compliance with requirements, provide one of the following:
 - 1. Armstrong World Industries, Inc.; Axiom.
 - 2. CertainTeed Ceilings; Approved equal.
 - 3. USG Interiors, Inc.; Compasso.

2.6 ACOUSTICAL SEALANT

- A. Acoustical Sealant, for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, joint sealant, recommended for sealing interior concealed joints to reduce airborne sound transmission.
 - 1. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. OSI (a division of Henkel); Pro-Series SC-175.
 - b. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
 - c. Pecora Corp.; BA-98.
 - d. Specified Technologies, Inc. (STI); Smoke N Sound Acoustical Sealant.
 - e. USG; SHEETROCK Acoustical Sealant.
 - 2. Provide sealants in compliance with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 3. Use sealants that have a VOC content of 250 g/L or less.
 - 4. Methylene chloride and perchloroethylene may not be intentionally added to sealants.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 6. Do not attach hangers to steel deck tabs.
 - 7. Space hangers not more than 48 o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

2. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Provide resilient wall base and accessories.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
 - Sustainable Design Documentation: Submit a completed Section 01 81 10 PRODUCT DATA SUBMITTAL FORM for each product.
- B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
- C. Extra Materials (Attic Stock): Submit extra stock equal to 2 percent of total installed.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

1.4 WARRANTY

A. Warranty: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 SUSTAINABLE DESIGN PERFORMANCE REQUIREMENTS

A. Chemical Content: Products shall be free of per- and polyfluoroalkyl substances (i.e. stain and water repellants), antimicrobials, chemical flame retardants, bisphenols and phthalates, organic solvents, heavy metals, isocyanates, and crumb rubber.

2.2 MATERIALS

A. Resilient Wall Base:

- 1. Manufacturer: Johnsonite, Inc., a division of Tarkett.
- 2. Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous). Do not use polyvinyl chloride (PVC).
 - a. Basis of Design: Johnsonite; Baseworks Thermoset Rubber Wall Base.
 - b. Fire-Test-Response Characteristics: ASTM E 84, Class B.
 - c. Material Ingredients: Cradle to Cradle (C2C) certifications.
 - 1). Phthalate-, chlorine-, and halogen-free.
 - d. VOC Emissions: CDPH v1.1 compliant, with SCS FloorScore certification.
- 3. Style: Cove.
- 4. Style: Straight.
- 5. Thickness: 0.125 inch

RESILIENT BASE

John A. Bishop Elementary School Renovation Project Arlington Facilities Department 25 Columbia Road, Arlington, MA 02474 Audrey O'Hagan Architects Project No. 228.00 May 25, 2023

- 6. Height: 4 inches.7. Height: 6 inches.
- Adhesives:
 - a. Basis of Design: Johnsonite; 960 Cove Base Adhesive
 - b. VOC Content: Less than 5 g/L.
 - Methylene chloride and perchloroethylene may not be intentionally added to adhesives.
 Do not use adhesives that contain urea formaldehyde.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations. Install in proper relation to adjacent work.
- B. Install base and accessories to minimize joints. Install base with joints as far from corners as practical.
- C. Clean and protect. Do not apply polish.

END OF SECTION

SECTION 096810

TILE CARPETING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Modular carpet tile.
 - 2. Carpet accessories.
 - 3. Substrate preparation for carpet and accessories.
- B. Allowances: Refer to Drawings and Section 012100 ALLOWANCES for requirements.
- C. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 09300 TILING for metal edge and transition strips.
 - 2. Section 096510 RESILIENT FLOORING AND ACCESSORIES for resilient wall base and accessories installed with carpet.
 - 3. Section 096820 SHEET CARPETING.
 - 4. Section 096910 ACCESS FLOORING for carpet tile substrate.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate required.
- B. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Carpet type, color, and dye lot.
 - 3. Existing flooring materials to be removed.
 - 4. Existing flooring materials to remain.
 - 5. Type of subfloor.
 - 6. Type of installation.
 - 7. Pattern of installation.
 - 8. Pattern type, repeat size, location, direction, and starting point.

TILE CARPETING

- 9. Pile direction.
- 10. Type, color, and location of insets and borders.
- 11. Type, color, and location of edge, transition, and other accessory strips.
- 12. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with the manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch-long Samples.
- D. Product Schedule: For carpet tile. Use the same designations indicated on Drawings.
- E. Maintenance Data: For carpet tiles include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet.

1.4 QUALITY ASSURANCE

- A. Carpeting Standard: Comply with the Carpet and Rug Institute's "CRI Carpet Installation Standard," 2011 edition, formerly CRI 104 "Standard For Installation Specification Of Commercial Carpet."
- B. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- C. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- D. Mockups: Before installing carpet, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with CRI Carpet Installation Standard, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

- A. General: Comply with CRI Carpet Installation Standard, Section 7, "Site Conditions."
- B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

TILE CARPETING

- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where equipment or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.7 WARRANTY

- A. Special Carpet Warranty: Written warranty, signed by carpet manufacturer agreeing to replace carpet that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
 - 1. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Colors, Styles and Patterns: To be selected by Allowance.
 - 2. Environmental Requirements: Provide carpet that complies with testing and product requirements of CRI Carpet and Rug Institute's "Green Label Plus" program.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by the carpet tiles manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
 - 1. VOC Limits: Provide adhesives with VOC content not more than 50g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.
- B. Concrete Subfloors: Comply with CRI Carpet Installation Standard, Section 9, "Testing Concrete Substrates." Verify that concrete slabs comply with ASTM F 710 and the following:

TILE CARPETING

- Slab substrates are dry and free of curing compounds, sealers, hardeners, and other
 materials that may interfere with adhesive bond. Determine adhesion and dryness
 characteristics by performing bond and moisture tests recommended by the carpet
 manufacturer.
- 2. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI Carpet Installation Standard, Section 7.3, "Site Conditions; Floor Preparation," and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Alkalinity and Adhesion Testing: Perform tests recommended by flooring manufacturer. Proceed with installation only after substrate alkalinity falls within a range on pH scale not less than 5 or more than 9 pH, or as otherwise required in writing by manufacturer of flooring.
 - 3. Moisture Vapor Emission Testing:
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours, or as otherwise required in writing by manufacturer of flooring.
 - 4. Relative Humidity Testing:
 - a. Perform relative humidity test, ASTM F 2170. Proceed with installation only after substrates have a maximum relative humidity level of 75 percent, or as otherwise required in writing by manufacturer of flooring.
 - 5. Perform tests indicated above and as recommended by flooring manufacturer. Proceed with installation only after substrates pass testing.
- C. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. General: Comply with CRI Carpet Installation Standard, Section 18 "Modular Carpet", and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: Partial glue down, install periodic tiles with releasable, pressure-sensitive adhesive.

TILE CARPETING

- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element and HEPA filter.
- B. Protect installed carpet tile to comply with CRI Carpet Installation Standard, Section 20, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

SECTION 099000

PAINTING AND COATING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Field painting of exposed interior items and surfaces; includes repainting of existing surfaces and trim.
 - 2. Surface preparation for painting.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 064020 INTERIOR ARCHITECTURAL WOODWORK for shop priming interior architectural woodwork.
 - 2. Section 081110 HOLLOW METAL FRAMES for factory priming steel doors and frames.
 - 3. Section 092110 GYPSUM BOARD ASSEMBLIES for surface preparation of gypsum board.

1.3 DEFINITIONS AND EXTENT

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
 - 3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 - 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.
- B. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
 - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

- C. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- D. Do NOT paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include the following factory-finished components:
 - Architectural woodwork.
 - b. Acoustical wall panels.
 - c. Toilet enclosures.
 - d. Metal lockers.
 - e. Kitchen appliances.
 - f. Elevator entrance doors and frames.
 - g. Elevator equipment.
 - h. Finished mechanical and electrical equipment.
 - i. Light fixtures.
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces.
 - b. Furred areas.
 - c. Ceiling plenums.
 - d. Utility tunnels.
 - e. Pipe spaces.
 - f. Duct shafts.
 - g. Elevator shafts.
 - 3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper and copper alloys.
 - e. Bronze and brass.
 - 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 - 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.4 SUBMITTALS

- A. Product Data: For each paint system indicated. Include block fillers and primers.
 - 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - a. Disclose material ingredients by name and Chemical Abstract Service (CAS) Registry Number.
 - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
 - 3. Environmental Product Declarations (EPD): For paints, submit EPDs.
 - 4. Material Ingredients: For paints, submit Cradle to Cradle (C2C) certifications. Health Product Declarations (HPD), or Declare product labels.
 - 5. Low-Emitting Materials: Building products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario.
 - a. For field-applied paints and coatings, submit test results, including TVOC emissions and VOC content, including GreenGuard Gold certifications.
- B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
 - 1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 - 2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
 - 3. Submit two eight inch by 12 inch Samples for each type of finish coating for Architect's review of color and texture only.
- C. Qualification Data: For Applicator.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
- C. Mockups: Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.
 - 1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.

- a. Wall Surfaces: Provide samples on at least 100 sq. ft.
- b. Small Areas and Items: Architect will designate items or areas required.
- 2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
 - a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.
- 3. Final approval of colors will be from benchmark samples.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
 - 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.7 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
 - Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 SUSTAINABLE DESIGN PERFORMANCE REQUIREMENTS

A. Chemical Content: Products shall be free of highly fluorinated chemicals (i.e. stain and water repellants), antimicrobials, chemical flame retardants, bisphenols and phthalates, organic solvents, and heavy metals.

2.2 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work are listed in the Finish Schedule at the end of this Section.

2.3 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: Refer to Finish Schedule.
- D. VOC Content for Interior Paints and Coatings: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Dry-Fog Coatings: 400 g/L.
 - 4. Primers, Sealers, and Undercoaters: 200 g/L.
 - 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 - 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 - 7. Pretreatment Wash Primers: 420 g/L.
 - 8. Floor Coatings: 100 g/L.
 - 9. Shellacs, Clear: 730 g/L.
 - 10. Shellacs, Pigmented: 550 g/L.
 - 11. Methylene chloride and perchloroethylene may not be intentionally added to paints and coatings.
 - 12. Paint must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
 - 1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
 - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions and technical bulletins for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime.
 - Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.

- c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
- 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
 - c. If transparent finish is required, backprime with spar varnish.
 - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
- 4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
 - a. Exterior Exposed Steel: Clean steel surfaces in accordance with SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning. Abrasive blast cleaned surfaces shall exhibit a uniform, angular profile of 1.5-3.0 mils. Prime cleaned surfaces within 8 hours and prior to surface rusting.
 - b. Interior Exposed Steel, in Humid Environments: Clean steel surfaces in accordance with SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning. Abrasive blast cleaned surfaces shall exhibit a uniform, angular profile of 1.5-3.0 mils. Prime cleaned surfaces within 8 hours and prior to surface rusting.
 - c. Interior Exposed Steel, in Dry Environments: Clean steel surfaces in accordance with SSPC-SP2 or SP3 Hand or Power Tool Cleaning.
- 5. Galvanized Surfaces: Clean galvanized surfaces in accordance with SSPC-SP16 Brush off Blast Cleaning of Galvanized Steel and NonFerrous Metals, to achieve a minimum 1 mil anchor profile.
- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
 - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 - 3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
 - 1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
 - 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 - 3. Provide finish coats that are compatible with primers used.
 - 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
 - 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 - 7. Paint backsides of access panels and removable or hinged covers to match exposed surfaces.
 - 8. Finish exterior doors and doors in wet areas on tops, bottoms, and side edges the same as exterior faces.
 - 9. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 - 2. Omit primer over metal surfaces that have been shop primed and touchup painted.
 - 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 - 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
 - 1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.

- 2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
- 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- F. Mechanical items to be painted include, but are not limited to, the following:
 - 1. Uninsulated metal piping.
 - 2. Uninsulated plastic piping.
 - 3. Pipe hangers and supports.
 - 4. Tanks that do not have factory-applied final finishes.
 - 5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - 6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
 - 7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- G. Electrical items to be painted include, but are not limited to, the following:
 - 1. Switchgear.
 - 2. Panelboards.
 - 3. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
 - 1. Provide satin finish for final coats.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:
 - 1. The Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
 - 2. Testing agency will perform appropriate tests for the following characteristics as required by the Architect.
 - 3. The Architect may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
 - After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 PAINT SCHEDULE

- A. Schedule: Provide products and number of coats specified. Use of manufacturer's proprietary product names to designate colors, materials, generic class, standard of quality and performance criteria and is not intended to imply that products named are required to be used to the exclusion of equivalent performing products of other manufacturers.
- B. Interior Paint Schedule:
 - 1. Interior Gypsum Wallboard (GWB), Latex Paint Finish:
 - a. One Coat, Primer: Moore Ultra Spec 500 Interior Latex Primer 534.

- b. And Two Coats, Flat Finish: At ceilings, and elsewhere as indicated.
 - 1) Moore Ultra Spec 500 Interior Latex Flat 536.
- c. And Two Coats, Eggshell Finish: At walls, and elsewhere as indicated.
 - 1) Moore Ultra Spec 500 Interior Latex Low Sheen 537.
- 2. Interior Architectural Woodwork, Finish Carpentry, and Wood Doors (softwoods, paint grade hardwoods, MDF, MDO, and hardwood veneers), Latex Paint Finish:
 - a. One Coat, Primer: Moore Ultra Spec 500 Interior Latex Primer 534.
 - b. And Two Coats, Semi-Gloss: Moore Ultra Spec 500 Interior Latex Semi-Gloss 539.
- 3. Interior Metals (Not specified to receive other coating systems/not shop finished), Acrylic Paint Finish:
 - a. One Coat: Approved primer, in shop under other Sections (where specified). If not shop primed, provide primer recommended by finish coating manufacturer.
 - b. And Two Coats: Moore Ultra Spec 500 Interior Latex Semi-Gloss 539.
- 4. Interior Exposed Steel, Joists, Ductwork, Conduit and Similar Items (where indicated), Dry-Fall or Dry-Fog Painted System:
 - a. One Coat: Moore Latex Dry Fall Flat 395 at 2.5 to 3.0 mils DFT.
- 5. Mechanical and Electrical Work: Paint all exposed items throughout the project except factory finished items with factory-applied baked enamel finishes which occur in mechanical rooms or areas, and excepting chrome or nickel plating, stainless steel, and aluminum other than mill finished. Paint all exposed ductwork and inner portion of all ductwork. Same as specified for other interior metals, hereinabove.

END OF SECTION

SECTION 101400

SIGNAGE

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Code-required interior panel signage, including but not limited to, accessibility signage, toilet room signage and mechanical and electrical room signage.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Division 26 ELECTRICAL for illuminated exit signs.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.
- B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
 - 1. Provide message list for each sign, including large-scale details of wording, lettering, artwork, and braille layout.
- C. Samples for Verification: For each type of sign, include the following Samples to verify color selected:
 - 1. Panel Signs: Full-size Samples of each type of sign required.
 - 2. Approved samples will not be returned for installation into Project.
- D. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each sign type through one source from a single manufacturer.

SIGNAGE

B. Regulatory Requirements: Comply with the Massachusetts Architectural Access Board, Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

1.5 PROJECT CONDITIONS

A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.

PART 2 - PRODUCTS

2.1 PANEL SIGNS

- A. General: Provide signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction as indicated. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch measured diagonally. Provide the following:
 - 1. Code-Required Signs for Certificate of Occupancy: Match Owner's Campus Standard.
 - 2. Interior Signs Based on Owner's Requirements: Match Owner's Campus Standard.
- B. Tactile and Braille Copy: Manufacturer's standard process for producing copy complying with ADA Accessibility Guidelines and ICC/ANSI A117.1. Text shall be accompanied by Grade 2 braille. Produce precisely formed characters with square cut edges free from burrs and cut marks.
 - 1. Raised-Copy Thickness: Not less than 1/32 inch
- C. Symbols of Accessibility: Provide 6-inch- high symbol fabricated from opaque nonreflective vinyl film, 0.0035-inch nominal thickness, with pressure-sensitive adhesive backing suitable for both exterior and interior applications.

2.2 ACCESSORIES

- A. Mounting Methods: Use double-sided tape fabricated from materials that are not corrosive to sign material and mounting surface.
- B. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify that items provided under other sections of Work are sized and located to accommodate signs.
- C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.
 - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
 - Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable.
 Where not indicated or possible, such as double doors, install signs on nearest adjacent
 walls. Locate to allow approach within 3 inches of sign without encountering protruding
 objects or standing within swing of door.
- B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:
 - 1. Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces. Do not use wetapplied adhesives.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by the Architect.

END OF SECTION

SECTION 21 00 01 FIRE PROTECTION SPRINKLER SYSTEMS

1.0 GENERAL

A. The information contained in this specification shall be considered confidential. This specification shall be used only for its intended purpose in conjunction with the project for which it has been prepared.

1.1 DESCRIPTION OF WORK

- A. The work under this specification shall include the furnishing and installation (herein referred to as "provide") of all materials, equipment, labor, and piping and appurtenances for the complete fire protection work, herein referred to as "the work" within "the project areas".
- B. The work under this specification shall be done by a currently licensed fire protection contractor in the Commonwealth of Massachusetts, herein refer to as "this Contractor", in strict accordance with applicable sections of NFPA, National Fire Code, and the local authorities having jurisdiction.
- C. The material and installation requirements in this specification are the minimum criteria and no reductions shall be permitted without written permission by the engineer/designer of record.
- D. Make the fire protection systems ready for regular operation and use by the Owner

1.2 GENERAL REQUIREMENTS AND RESPONSIBILITIES

- A. Examine the sections of all Divisions which affect work under this section whether or not such work is specifically mentioned in this section.
- B. Coordinate work with that of other trades affecting or affected by work of this section. Cooperate with such trades to insure the steady progress of work under the contract.
- C. Obtain, read, and follow to the letter, the fire protection piping, equipment, specialties, and manufacturer's requirements and install said items and systems in a timely manner so as not hinder the established project schedule.
- D. Order, purchase and have on site the specified materials before they are needed and in such quantities that delays of transportation (truck, railroad, etc.), weather conditions, etc., shall not delay his work or the established project schedule.
- E. Examine sections of this project's contract specifications and drawings for requirements pertaining to and affecting the fire protection work.

- F. Examine the latest architectural drawings (including floor plans, elevations, details, etc.) for the requirements pertaining to and affecting the fire protection work and incorporate such requirements into the scope of work.
- G. Review the latest architectural drawings for the latest footprints, room names, and room numbers as these shall take precedence.
- H. Prior to construction, review with the local authorities having jurisdiction the installation, supplementary requirements and amendments to the above and incorporate into work.
- I. Do not purchase and/or install the fire protection systems or appurtenances without first verifying the local supplementary requirements or amendments.
- J. Comply with the Owner's required safety training program.
- K. It shall be this Contractor's responsibility to verify the sprinkler heads specified with the local Fire Marshal prior to purchase or installation.
- L. Provide sprinkler heads above ceiling spaces to protect any above interstitial areas.

1.3 SCOPE OF WORK

- A. Visit the site where the new work is to be performed. Visit existing areas where the demolition and renovation work are to be performed. Inspect existing piping systems and where new-to-existing connections will be made. Ascertain the amount of work required and complexity of the demolition and installation, as well as determine the phasing required to adhere to project schedule.
- B. Study the contract documents including the architectural documents to determine the exact extent of the work, as well as to ascertain the difficulty to be encountered in performing the work, in installing new equipment and systems, and in coordinating the work with the other trades.
- C. Perform work and provide permits, transportation, freight, materials, appurtenances, machinery, equipment, tools, loading, unloading, sleeving, core-drilling, testing, labeling, labor and supervision necessary, as shown on the drawings and as specified to install, complete, and make ready for continuous operation, the fire protection systems.
- D. Drawings and Specifications form complementary requirements. Provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although some work may not be specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.
- E. The pipe hangers, supports, and appurtenances shall properly hang the piping systems. They shall be furnished and installed with specific regard to maintaining appearance and accessibility as well as be in compliance with applicable laws, regulations.
- F. The fire protection work shall include, but not be limited to, the following:

- 1. Wet sprinkler piping, fittings and connections (this Contractor shall design, hydraulically calculate and field run all piping).
- 2. Dry sprinkler piping, fittings and connections (this Contractor shall design, hydraulically calculate and field run all piping).
- 3. Sprinkler "return bend drops" (a.k.a. arm-overs) and appurtenances.
- 4. Wet alarm check valve and trim.
- 5. Dry alarm check valve and trim.
- 6. Alarm and supervisory switches.
- 7. Valves.
- 8. Inspector's test connections and drain piping.
- 9. Sprinkler heads, escutcheon plates, and appurtenances.
- Hydraulic calculations and working contract drawings performed and produced by this Contractor.
- 11. System identification.
- 12. Core drilling.
- 13. Fire stopping.
- 14. Pipe hangers, supports, anchors, supplementary steel, flashing, inserts, seals, vibration isolation, and seismic restraints.
- 15. Hydrant flow test performed by this Contractor and witnessed by the local Fire Department and/or the Arlington Water Department.
- 16. Shop drawings for materials and equipment.
- 17. Systems cleaning and testing.
- 18. Systems identification.
- 19. Spare parts.
- Guarantees.
- 21. Record drawings.
- 22. Instruction manuals.

1.4 RELATED WORK SPECIFIED ELSEWHERE

- A. All of the Contract Documents, including General, Bidding Documents, Contract Forms and Conditions of the Contract, and Division 01 General Requirements, apply to the work of this Section.
- B. Examine all Drawings and all Sections of the Specifications for the requirements and provisions affecting the work of this Section.

1.5 CODES AND STANDARDS

- A. The fire protection systems shall be installed in conformance with the governing codes, regulations, local ordinances, and authorities having jurisdiction. Become familiar with governing codes and requirements and report noncompliance of the plans and specifications to the Construction Manager prior to entering into the contract. These requirements are minimum criteria and no reductions permitted by code shall be allowed without written permission of the Construction Manager.
- B. File drawings, pay fees, and obtain permits and certificates of inspection relative to the work. Arrange for inspections with the proper authorities having jurisdiction and include the costs of the permits and inspections in his package and shall schedule such inspections, giving the Construction Manager a minimum of 48 hours advance notice such that the inspections may be witnessed. Copies of fire protection permits and certificates of inspection shall be forwarded to the Construction Manager and the engineer of record.
- C. The fire protection layout, workmanship, methods, and materials shall meet the highest standards of the trade and shall conform to the latest editions of the following associations:
 - 1. Massachusetts Fire Prevention Code, with latest applicable amendments.
 - 2. Massachusetts State Building Code, with latest applicable amendments.
 - 3. Applicable local codes, and the local authorities having jurisdiction.
 - 4. National Fire Protection Association (NFPA).
 - 5. American National Standards Institute (ANSI).
 - 6. American Society for Testing Materials (ASTM).
 - National Bureau of Standards (NBS).
 - 8. National Sanitation Foundation (NSF).
 - 9. National Electrical Manufacturers Association (NEMA).
 - 10. National Electric Code (NEC).
 - Cast Iron Soil Pipe Institute (CISPI).
 - 12. American Water Works Association (AWWA).

- 13. Occupational Safety and Health Act (OSHA).
- 14. The Owner's Internal Safety Program.
- 15. Underwriters' Laboratories (UL).
- 16. Factory Mutual (FM).

1.6 REFERENCES

- A. ANSI/ASME B16.3 Malleable Iron Threaded Fittings, Class 150 and 300
- B. ANSI/ASME B16.4 Cast Iron Threaded Fittings, Class 125 and 250
- C. ANSI/ASME B36.10 Welded and Seamless Wrought Steel Pipe
- D. ANSI/ASTM A47 Malleable Iron Castings
- E. MSS-SP-80 Bronze, Gate, Globe, Angle and Check Valves
- F. ANSI/AWWA C110 Ductile Iron and Gray Iron Fittings
- G. AWWA C-151/ANSI 21.51 Ductile Iron and Gray Iron Fittings
- H. ASTM A181 Malleable Iron
- ASTM A182 Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings
- J. AWWA C606 Cut Groove Fittings
- K. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc-coated (Galvanized) Welded and Seamless
- L. ASTM A120 Pipe, Steel, Black and Hot-Dipped, Zinc-coated (Galvanized) Welded and Seamless, for Ordinary Uses
- M. AWS D10.9 Specifications for Qualification of Welding Procedures and Welders for Piping and Tubing
- N. ANSI/ASME Section 9 Welding and Brazing Qualifications.
- O. ANSI/ASME B32 Solder Metal.
- P. ANSI/NFPA 30 Flammable and Combustible Liquids Code.
- Q. ANSI/ASME A13.1 Scheme for the Identification of Piping Systems.
- R. ANSI/NFPA 70 National Electric Code.
- AWS Standard manual of pipe welding of the Heating and Piping Contractor's National Association.
- T. AWS A5.8 Brazing Filler Metal.

- U. NFPA 13 Standard for the Installation of Sprinkler Systems.
- V. State and Local Fire Marshal's.
- W. Local fire department.

1.7 QUALITY ASSURANCE

- A. For each product specified, provide components by same manufacturer throughout.
- B. Provide domestic components (non-foreign), acceptable by state standards and approvals throughout.
- C. References to manufacturers and catalog designations are intended to establish standards of quality for performance and materials but imply no further limitation of competitive bidding.
- D. Materials shall be labeled with manufacturer's pertinent information, delivered in non-broken, factory-furnished packaging, and stored in a clean, dry indoor space that provides protection against the weather.
- E. Testing of the systems shall be completed, inspected, and approved by the Owner's Representative before insulation is applied.
- F. Welding shall be in accordance with latest applicable American Welding Society Code (AWS). Provide certification that welders to be employed for work have passed AWS qualification tests. If recertification of welders is required, re-test at no additional cost to the Owner. Employ certified welders in accordance with ANSI/ASME Section 9 or AWS D10.9.
- G. Equipment and Components shall bear UL and FM labels or markings.
- H. Except as modified herein, work shall conform to the required and advisory provisions of NFPA for equipment, materials, installation, workmanship, examination, inspection and testing. Include materials, accessories and equipment, inside and outside the project areas, and for the system to be complete and ready for use. Provide for the system to accommodate piping, electrical equipment, and other construction and equipment. Provide devices and equipment for fire protection service, which are UL listed or FM approved for use in fire protection systems. In the NFPA publications referenced, the advisory provisions are considered to be mandatory, as though the word "shall" had been substituted for the word "should" wherever it appears.
- I. Provide materials and equipment which are products of a manufacturer engaged in the manufacture of the products specified for at least the past five (5) years. Provide products that are equivalent to those that have been in operation in at least five (5) facilities for a minimum of two (2) years.
- J. Become familiar with details of the work, verify dimensions in the field, and advise the Construction Manager of discrepancy before performing the work.
- K. Valves shall bear UL and FM labels or markings. Provide manufacturer's name and pressure ratings marked on valve body.

1.8 SHOP DRAWINGS AND SUBMITTALS

- A. Submit for approval by the Construction Manager and the engineer of record shop drawings for equipment and materials proposed for installation prior to ordering, purchasing, or fabricating equipment or materials. Shop drawings shall be catalog cuts, material lists, and samples where necessary, containing complete performance data, engineering calculations, dimensions, power requirements, descriptions, installation requirements and particulars. Submittals only naming a trade name or dealer's name shall not be considered.
- B. Work shall not commence before the approval of the Construction Manager and the engineer of record has been received. Data shall be submitted sufficiently in advance of the work to allow proper time for examination and correction.
- C. The Construction Manager's approval of submittal data shall not relieve this Contractor for deviations from drawings and specifications, unless he/she has, in writing, called the Construction Manager's attention to such deviations at the time of submission.
- D. Check shop drawings and submittal data for compliance with the plans and specifications.
- E. Before submitting shop drawings and submittal data, affix a stamp indicating that he has determined and verified field measurements and quantities, field construction criteria, materials, catalog numbers and similar data, and that he has reviewed and coordinated the information in the shop drawings with the requirements of work and the contract documents. Failure to comply with the above shall cause immediate rejection of submittal.
- F. Submit cut sheets of items specified along with those proposed.
- G. Equipment and materials requiring submittal for approval shall include, but not be limited to the following:
 - 1. Pipe materials and fittings.
 - 2. Sleeve and core drill packing and seals
 - Valves.
 - Sprinkler heads.
 - 5. Wet and dry alarm check valves and trim.
 - Alarm switches.
 - 7. Hydraulic calculations.
 - 8. Complete set of working drawings including piping layouts and details.
 - 9. System identification.
 - 10. Dimensions of components.

- H. Shop drawings shall include the location of core drillings and other openings which pass through or into concrete or steel construction. Drawings shall be prepared at earliest practicable date to expedite orderly progress of the work.
- I. Include component sizes, equipment and piping, rough-in requirements, replacement parts lists, service sizes, and finishes.
- J. Clearly indicate makes, models, locations, types, sizes, pressure ratings and system components. Delete inapplicable material.
- K. Submit shop drawings indicating complete material data, a list of materials proposed for this project, indicate thickness of material for individual services.
- L. Submit copies for approval and record of tests.
- M. Submit list of wording, symbols, letter size, and color coding for fire protection.
- N. Tabulate products by section number and paragraph.
- O. Contract closeout information:
 - 1. Operating and Maintenance Data
 - 2. Owner Instruction Report
 - 3. Guarantees
 - 4. Parts kit
- P. Indicate hydraulic calculations, manufacturer's product data, performance data, detailed pipe layout, hangers and supports, components and accessories, checkout, field and functional testing submittals, and manufacturer's pressure vessel compliance certificate.
- Q. Shop drawing submittals shall be stamped and approved by the local fire department prior to submission for approval.
- R. Include written maintenance data on components of system, servicing requirements, and record drawings.
- Indicate valve data and ratings.
- T. Shop drawings submitted based on document submission other than the "Construction" issue shall be immediately returned as "Revise and Resubmit Based on the Construction Documents".
- W. Providing of equipment shop drawings that, in the opinion of this Contractor, are "equal to" or similar shall require Contractor verification (procedural, legal and regulatory).

1.9 SUBSTITUTIONS

- A. The term "or approved substitute" shall mean approved in equal in the sole opinion of the engineer of record. Alternate products or materials which are similar in characteristics to those specified may be considered by the engineer of record. No products or materials shall be used in "substitution" to those specifically designated by name in the specifications unless they have been approved in writing by the engineer of record.
- B. When the term "or approved substitute" appears after the specified item, requests for substitutions shall be made in writing. A request for substitution only naming a trade name or dealer's name shall not be considered.
- C. A request for substitution shall not be considered or accepted unless the term "or approved substitute" follows the specified item. This does not apply to model number changes by specified manufacturer.
- D. The request shall contain detailed material data, manufacturer's name, model and catalog numbers, and a specific reason for the deviation so that a proper evaluation may be made.
- E. Substitutions may be requested by the successful bidder after signing of the contract in the following manner:
 - 1. Submit to the Construction Manager copies of detailed data of the proposed item or items to be substituted along with a letter notifying the Construction Manager of the proposed change.
 - A statement indicating the amount of change to the contract price for the proposed substitution. After reviewing the proposed change, the Construction Manager shall inform this Contractor of the decision by letter.
 - The model and data specified for each item of equipment or material heading in these specifications relates to the brand name indicated and is used as the standard of quality, performance and suitability required.
 - 4. The approval of substitution of equipment does not relieve this Contractor of valid charges for additional work performed by the Construction Manager, other Contractors, or the Architect.

1.10 EXAMINATION OF PREMISES

- A. Prior to the ordering or purchasing fire protection equipment and materials, or the layout or installation of work, examine the premises and verify the existing conditions. Report in writing to the Construction Manager unsuitable conditions which might adversely affect this Contractor's work.
- B. If work is involved with existing equipment or services, model numbers, sizes, electrical characteristics, it shall first be verified to be compatible with the new work and equipment shown on the drawings.
- C. Commencement of work shall be construed as complete acceptance of existing conditions and preparatory work.

1.11 USE OF PREMISES

- A. Confine apparatus, storage of materials, and construction operations as directed by the Construction Manager and do not encumber the premises with materials.
- B. Enforce instructions of the Owner and Construction Manager regarding safety, signs, advertisements, fires, danger signals, barricades, and smoking, and require persons employed to comply with facility or institutional regulations while on the premises.
- C. Conduct work so as not to interfere with the functioning of existing services.

1.12 INTERPRETATION OF DRAWINGS

- A. The drawings convey the general arrangement of the systems, scope of work, and function of systems.
- B. The exact arrangement and location of piping and equipment shall be determined from shop drawings and accurate, field-coordinated measurements and conditions.
- C. The exact locations to secure the conditions and project results shall be determined at the project site with written approval from the Construction Manager before proceeding with the installation.
- D. Follow the drawings in laying out the work and checking the drawings of other trades to verify spaces in which the fire protection work is to be installed. Maintain maximum headroom and space conditions at points. Where headroom or space conditions appear inadequate, notify the Construction Manager before proceeding with the installation.

1.13 TYPICAL DETAILS

A. Where shown on the drawings, typical details shall apply to similar items. Alternate methods require approval by the Construction Manager.

1.14 DESIGN CRITERIA

- A. It shall be this Contractor's responsibility to perform a flow test prior to commencing work and shall utilize the worst-case scenario flow test as a basis for his work, in accordance with the requirements of the local Fire Marshal.
- B. Secure water flow test data taken from fire hydrants nearest to the project areas. A minimum of 20 psi drop in pressure between the static and residual pressures shall be required to obtain accurate data unless a flow test was performed within 12 months prior to start of contract.
- C. The project areas shall be protected by a wet sprinkler system complete with appurtenances. Continue the alarm check valves, appurtenances and piping from their connection points into the project areas (complete systems).

- D. In addition, coverage for the interior tank supports and structural steel supports shall be provided in accordance with NFPA recommendations, and the local Fire Marshal's requirements.
- E. Provide test connections at the highest point of the main portion of the sprinkler system with a 1-inch pipe and valve. The test pipes shall be connected to the sprinkler pipe at least 1-1/4 inch and shall discharge near either the ground level outside the building via a full size smooth bore brass outlet or into the sprinkler waste outlet if provided The outlet location shall be where it can be seen and in accordance with the local Fire Marshal's requirements.
- F. It is assumed that the pressure and flow characteristics of the fire water supply will support the proposed fire protection renovations. It is further assumed that the source of supply water is a separate fire water supply main whereby the municipal or domestic water supply is protected by some means of backflow prevention complying with applicable state and local codes.
- G. The fire protection plans are schematic representations of the work intended. Exact pipe sizes, as well as locations, shall be determined once the hydraulic calculations are completed. The exact location of valves, appurtenances, and piping runs shall be coordinated with other trades and the local Fire Marshal prior to installation.
- H. As part of the design phase, determine, in accordance with the requirements of the NFPA 13 and the local Fire Marshal, the classification and design with respect to the actual materials/chemicals being stored/used.

1.15 COORDINATION OF TRADES

- A. Cooperation and coordination (prior to the installation) with other trades in providing the fire protection systems for this project is the responsibility of this Contractor. Do not take liberties when installing the fire protection systems within the project area. Coordinate pipe runs and system appurtenances including setting centerline elevations and pipe offsets from the facility walls and columns. The Construction Manager shall schedule discipline coordination meetings so as to allow a speedy and efficient completion of the project. As work progresses, submit coordination drawings, to scale, to the Construction Manager for areas of possible conflicts requiring close coordination with other trades.
- B. Prior to the submission of coordination drawings, check approved equipment shop drawings to verify that they comply with the contract requirements, and that the equipment and materials submitted fit the available space. Deviations from the Contract requirements shall not be acceptable without prior written approval from the Construction Manager.
- C. Prior to purchase or installation of materials and equipment, verify the dimensions depicted on the fire protection contract drawings with those of the other trades within the project areas.
- D. Verify centerline elevations of piping systems within the fire protection scope of work with actual field conditions prior to sleeving or core drilling, hanging, or supporting pipe. If this Contractor purchases and/or installs the fire protection system or its appurtenances without first verifying centerline elevations of the piping, costs incidental to making changes shall be paid for by this Contractor without backcharges.
- E. If there is evidence that the fire protection system's work interferes with the work of other trade in manner, assist in working out space conditions to make necessary and satisfactory adjustments.

Coordination to avoid conflicts shall include but not be limited to fire protection for locations of water supply and drainage and vent mains, equipment, and fixtures; Electrical for location of lighting fixtures, cable trays, duct banks, and appurtenances; Mechanical for location of ductwork, diffusers, registers, and appurtenances; Structural for beams, columns, walls, etc.; and Architectural for the area footprints and finishes.

- F. Provide advance information on locations and sizes of frames, boxes, and openings needed for this Contractor's work to the other trades. Provide information and provide necessary drawings to permit trades affected by the fire protection work, to install their work properly and without delay.
- G. As approved by the Owner and the Construction Manager, this Contractor may make modifications in the layout as needed to prevent conflicts with other trades, for the proper execution of work by the other trades, or for the proper execution of this Contractor's work. This Contractor shall pay expenses for additional openings, relocations or enlargements of existing openings through concrete floors, walls, beams and roofing.

1.16 TRANSFERRING OF INFORMATION

- A. Obtain detailed information from the manufacturers of the apparatus to be provided and from the other trades as to the proper method of installing and connecting the fire protection systems.
- B. It shall be this Contractor's responsibility to keep apprised as to the shape, size and position of openings required for materials and equipment under this section and give full information to be other trades sufficiently in advance to allow proper access requirements.
- C. In case of failure on the part of this Contractor to give information as noted above and to save delays caused by approvals, this Contractor shall have the necessary cutting and patching performed by the appropriate trade at this Contractor's expense, but in case additional work shall be performed at no additional cost.
- D. All information furnished by this Contractor shall include opening sizes and locations and other pertinent information relative to the fire protection installation that the Construction Manager may deem necessary for a properly coordinated installation. The dimensions of major pieces of mechanical equipment shall be furnished and the clearances that shall be required throughout the facility to allow for the passage of same through the facility to their required installation locations shall be scheduled.

1.17 RECORD DRAWINGS

- A. One (1) week upon completion of construction, submit to the engineer/designer of record a complete set of full-size legible record drawings showing <u>accurate</u> final drawing changes and locations with superseded and design data removed.
- B. This Contractor shall clearly show changes to the work as a result of change orders, instructions issued by the Construction Manager, and conditions encountered in the field. Accurately indicate the location, size, type and elevations of fire protection utilities under this contract.

- C. The record drawings shall consist of one (1) set 24¹¹ x 36¹¹ prints and one (1) set of AutoCAD disks (AutoCAD 2009 or compatible format) applicable to this Section.
- D. Deliver the completed record drawings and disks properly titled and dated to the Owner and to the engineer/designer of record within the time limit prescribed herein. The record drawings shall become the property of the Owner.

1.18 LAWS, ORDINANCES AND ENGINEER INSPECTIONS

- A. File drawings and specifications prepare documents and obtain required Permits and Certificates of Inspection for the work, at this Contractor's expense, and deliver same to the Construction Manager before submitting the request for acceptance and final payment for the work.
- B. All materials provided shall comply with requirements of the local utility companies, with the recommendations of local utility companies, and with the requirements of the Commonwealth of Massachusetts and the City of Arlington.
- C. Upon approximately 80% completion of the fire protection systems (before fire protection system concealment), and then again upon completion of the project areas and before issuance of the Certificate of Occupancy, notify the engineer of record in order to make inspections, as required by law.
- D. Provide the engineer of record with a minimum of three (3) working days' notice for said inspections.
- E. Variations from the approved construction documents shall be noted and the Construction Manager and Owner shall be notified of the discrepancies found.
- F. Periodic observations and inspections by the responsible engineer shall not be construed as supervision of actual construction or final inspection.

1.19 COMPLETENESS OF WORK

A. The omission from the plans and specifications of expressed references to reasonable labor or materials necessary for the proper executing or completion of the work, shall not relieve this Contractor from furnishing them in keeping with the basic character and intent of the work.

1.20 WORK PERSONNEL

- A. Furnish first-class skilled workmen for work, and keep a competent foreman or superintendent on premises at times during the progress of the work that shall have the authority to act for and in behalf of this Contractor during the latter's absence with regard to directions given to him by the Construction Manager.
- B. All careless or incompetent personnel shall be removed forthwith by this Contractor when he is notified to do so by the Construction Manager or his authorized representative.

1.21 SAFETY PRECAUTIONS

- A. Comply with of the safety requirements of OSHA and the Owner's Internal Safety Program throughout the entire period of construction.
- B. Provide and maintain proper guards for prevention of accidents and to secure safety of life and property.
- C. Comply with the Owner's sign-in/sign-out programs that may apply.

1.22 WORKMANSHIP

- A. Provide a neat workable installation utilizing good craftsmanship, and the work shall be executed as rapidly as possible.
- B. All piping shall be run in the most direct, straight and mechanical manner and be properly graded. Where pipes terminate under this contract, the centerline elevations at such points shall be checked for conformity by this Contractor prior to installation.
- C. The decision of the Construction Manager as to the character of labor provided by this Contractor shall be final and conclusive on both this Contractor and the Owner.

1.23 PROTECTION OF WORK AND PROPERTY

- A. This Contractor shall be responsible for the care and protection of work included under this section until it has been tested and accepted.
- B. All pipe openings shall be temporarily closed so as to prevent obstruction damage.
- C. Protect equipment and materials from damage from causes including weather, water, frost, accident and theft. materials and equipment damaged or stolen shall be repaired or replaced with equal material or equipment.
- D. Protect equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials or other trades from damage that might be caused by work or workmen and make good damage thus caused.
- E. This Contractor shall care for his own tools, equipment and materials, and shall be responsible for their safekeeping at time.
- F. Replace stolen, lost, or damaged items relative to the installation and operation of the fire protection systems before the project areas are accepted.

1.24 SURVEYS AND MEASUREMENTS

A. Base measurements, both horizontal and vertical, from reference points established by the Construction Manager and shall be responsible for correctly laying out his work.

B. In the event of a discrepancy between actual measurements and those indicated, notify the Construction Manager, in writing, and shall not proceed with this work until written instructions have been issued by the Construction Manager.

1.25 NAMEPLATES

- A. Where applicable, the manufacturer's nameplates or trademark shall be permanently affixed to equipment and materials furnished under this specification. The nameplate of this Contractor or distributor is not acceptable.
- B. Project nameplates shall identify each item of equipment including controls with a permanently attached project nameplate, identifying each piece of equipment as identified on the equipment schedule or on the drawings, and shall include the serial number and date of manufacture.
- C. Project nameplates shall be at least one inch high engraved with letters at least one-half inch high.

1.26 SELECTION, ORDERING, DELIVERY, STORAGE AND HANDLING OF EQUIPMENT AND

MATERIALS

- A. Arrange for the purchase and delivery of materials and equipment required in sample quantities and at the proper time. Immediately notify the Construction Manager of inability to obtain suitable delivery of apparatus or materials required.
- B. Certain fire protection system materials and components may require extended lead-time to purchase and deliver. Determine and schedule lead-time requirements for the system components including but not limited to piping and appurtenances, special valves, etc. prior to submitting his bid.
- C. No relief shall be granted to this Contractor for the system piping materials or appurtenances availability based on prolonged delivery times or schedules.
- D. Give personal supervision and direction to the delivery and storage of materials specified and shall pay strict attention to established project schedules.
- E. Store, handle and protect products under provisions set forth by the piping and equipment manufacturers and as specified.
- F. Fire protection materials and equipment shall neither be stacked nor shall be exposed to direct sunlight. fire protection materials and equipment shall be kept fully covered.

1.27 EXTRA SPRINKLER HEAD STOCK

- A. If this Contractor provides sprinkler heads not specified or other than those in the original design, provide extra sprinkler heads and special sprinkler wrenches for each type and temperature rating in accordance with NFPA 13 and the local authorities having jurisdiction.
- B. Provide extra sprinkler heads and special sprinkler wrenches for each type and temperature rating in accordance with NFPA 13.
- C. Provide a metal storage cabinet in a suitable location acceptable to the Fire

Marshal.

D. 1.28 CUTTING AND PATCHING

- A. Concrete cutting and patching associated with the installation of the fire protection systems shall be the responsibility of this Contractor. He shall repair disturbed concrete including steel reinforcing and paint to match existing conditions.
- B. When materials of other trades are to be cut or fitted in the shop, furnish the necessary drawings to the trades whose materials shall be cut or fitted.

1.29 UTILITIES

A. Provide utilities such as water, fuel, and electricity for tests associated with or specified for the fire protection work.

1.30 TEMPORARY OPENINGS

- A. Arrange for the Construction Manager to provide special temporary openings in the structure and in the exterior walls for the admission of apparatus provided as part of the fire protection work.
- B. Provide for temporary closings as work progresses, completely acceptable to the Construction Manager.

1.31 ACCESSIBILITY

- A. Install fire protection systems work so that parts shall be readily accessible for inspections, operation, maintenance, and repair.
- B. Minor deviations from the drawings may be made for this purpose, but changes of magnitude shall not be made without prior written approval of the Construction Manager.

1.32 ACCESS PANELS

A. Provide access panels for walls, ceilings and floors to permit access for adjustment, removal and replacement, and servicing of fire protection system appurtenances requiring access and other items requiring maintenance and adjustment.

- B. All access panels shall be located in a workmanlike manner in accordance with the requirements of the architectural specifications.
- C. Access panels shall have an equal to or better fire rating than the wall or ceiling it serves.

1.33 FIREPROOFING

- A. All clips, hangers, clamps, supports and other attachments to the fireproofed structure shall be coordinated with other trades in order to avoid damage to the fire proofing.
- B. All items which would interfere with the proper application of fireproofing shall be installed after the application of fireproofing work. Provide patching of disturbed fireproofing.

1.34 SUPPLEMENTARY STEEL, CHANNELS, AND SUPPORTS

A. Furnish and install supplementary steel and structural supports required for the proper installation, mounting and support of fire protection piping and equipment.

1.35 ANCHORS AND FASTENERS

- A. Provide anchors and fasteners required for the pipe supports and for the attachment of hangers within the project areas.
- B. Necessary bolts, anchor bolts, nuts, washers, and plates for the fire protection work shall be included.

C. 1.36 HANGERS AND SUPPORTS

- A. Unless otherwise shown or specified, provide hangers, structural supports, plates, shields, turnbuckles, brackets, stands, nuts, washers, and bases required to support piping within the project areas.
- B. Inserts, anchors and similar items set into the concrete shall be the responsibility of this Contractor.

1.37 PORTABLE OR DETACHABLE PARTS

- A. Retain portable and detachable parts and portions of the installation and other devices or materials that shall be relative to and necessary for the proper operation and maintenance of the fire protection systems until final completion of the work.
- B. Replace stolen, lost, or damaged items relative to the installation and operation of the fire protection systems before the facility is accepted.

1.38 SEISMIC RESTRAINTS

- A. Provide the design, materials, and installation of seismic restraints complete with supports, hangers, bracing, fasteners and structure connections to ensure a complete and code compliant installation.
- B. The seismic design shall comply with requirements as listed in the National Building Code BOCA, the NFPA, latest copy of the State of Massachusetts Building Code, as well as the requirements of the NFPA and the local authorities having jurisdiction.
- C. Seismic bracing for piping shall comply with MSS SP-127-2001, Manufacturers Standardization Society Standard for Bracing for Piping Systems, Seismic-Wind-Dynamic, Design, Selection, Application, as well as the NFPA.

1.39 CATHODIC/ELECTROLYTIC PROTECTION

Connections between dissimilar metals shall be made with dielectric

nipples.

1.40 TESTING AND ADJUSTING

- A. Test work and systems and make adjustments and corrections to provide a complete, first-class working system.
- B. Make adjustments and place piping systems in operation and demonstrate the proper functions of the piping systems, equipment, and controls.

1.41 CERTIFICATES OF APPROVAL

- A. Upon completion of work and after the necessary periodic inspections have been made by the authorities having jurisdiction, copies of inspection reports and approvals shall be forwarded to the Construction Manager by this Contractor.
- B. Refer to the Construction Manager for requirements pertaining to substantial completion and Final Acceptance, of which shall be provided for under this section.
- C. Coordination with the authorities having jurisdiction pertaining for the Contactor-provided paperwork required for final acceptance and certificates of occupancy (CO) shall be the sole responsibility of this Contractor.
- D. Once the sprinkler system has been approved by the local authorities having jurisdiction, copies of this Contractor-required paperwork shall be delivered to the local authorities having jurisdiction and to the

Construction Manager by this Contractor within three (3) working days of said approval.

1.42 GUARANTEE

- A. Manufacturers shall provide their standard warranties for materials and equipment furnished under this section. Such warranties shall be in addition to and not in lieu of liabilities which the manufacturer and Contractor may have by law or by provisions of the Contract Documents. It shall be the responsibility of this Contractor to obtain from the piping and equipment manufacturers written guarantees covering their respective equipment for the above period of time.
- B. All materials, equipment and work provided under this project as a whole shall be guaranteed, by this Contractor, against defects in materials and workmanship for a period of one (1) year (or as delineated in Division I, whichever is greater in time) commencing with the date of final acceptance by the engineer of record. Failure due to defective material, equipment or workmanship which develops shall be corrected by this Contractor at no expense to the Owner including damage(s) to the areas, materials and other systems resulting from such failures.
- C. The system shall be flushed and cleaned prior to final connections. If part of the system should be stopped by foreign matter being placed in the systems, disconnect the system, clean, and reconnect wherever necessary to locate and remove obstructions. Repair or replace work damaged in the course of removing obstructions.
- D. Upon receipt of notice from the Owner of failure of any part of the systems during the guarantee period, the affected parts shall be replaced. Any equipment requiring excessive service shall be considered defective and shall be replaced.
- E. If any part of a system should be stopped by foreign matter being placed in the systems, disconnect the system, clean, and reconnect wherever necessary to locate and remove obstructions. Repair or replace any work damaged in the course of removing obstructions.
- F. Under no circumstance will the one (1) guarantee commence until this Contractor's contractual obligations to the Owner have been fulfilled in their entirety (i.e. purchase, installation, cleaning, testing, start-up, balancing, commissioning, etc.).
- G. The system(s) will not be accepted until this Contractor proves to the Owner, Construction Manager, and engineer of record that they are code-complaint and operating pursuant to the contract documents; that this Contractor's project manager has personally verified that all punch list items have been properly addressed as written; and that the systems are commissioned with the commissioning report and construction Affidavit approved in writing by the engineer of record. The Affidavit is a Massachusetts Building Code requirement and shall supersede all other documents.

1.43 MAINTENANCE MANUALS

A. Provide bound manuals containing operating, installation, and maintenance instructions for equipment in numbers acceptable to the Owner.

1.44 CLEAN UP AND REMOVAL OF RUBBISH

- A. Keep the project areas and site clean from the accumulation of rubbish and waste materials and, upon completion, leave the project areas, the site and the installation in a clean condition, completely acceptable to the Architect and to the Construction Manager.
- B. Obtain dumpster permit from local Fire Department.

- C. At the completion of the work, remove tools, scaffolding, debris and waste and unused materials from and about the premises.
- D. All items shall be secure and in their final positions and shall present a neat and workmanlike appearance.
- E. All temporary bracing, cross ties and the like shall be removed.
- F. All items shall serve the purpose for which they are intended, i.e., to support, anchor, frame, blockout, etc. Finish items to present accurate, true, plumb, finished and completed appearances.
- G. All stains and/or damage done to the finish of the project areas that is caused by faulty workmanship and/or improper handling of materials regarding to this installation shall be cleaned, removed and/or replaced.

1.45 POWER WIRING AND ELECTRICAL WORK

- A. All power wiring shall conform to the requirements of the Electrical specifications and as shown on electrical drawings.
- B. Provide appurtenances as specified for the fire protection systems in accordance with the manufacturer's requirements for a complete system. Wiring for interlocking, protective or signal devices for systems operation, control devices, circuit breakers, switches, control panels and enclosures shall be by the Electrical Contractor and shall conform to the requirements of the Electrical specifications.

2.0 PRODUCTS

2.1 MATERIALS

- A. All materials shall conform to the requirements of Factory Mutual, Underwriters Laboratories, NFPA, Local and Federal Codes and Standards, Federal specifications and standards listed such as Commercial, ASTM, and requirements specifically stipulated herein.
- B. Systems, manufacturers, and model numbers listed herein set forth a standard for quality however they shall be pre-confirmed by this Contractor with the engineer of record and the local authorities having jurisdiction prior to ordering or installation.

2.2 ACCEPTABLE MANUFACTURERS

- A Specialty valves: Simplex, Globe Fire Sprinkler, Milwaukee, Reliable Automatic Sprinkler, Victaulic, Viking, or approved substitute.
- B. Waterflow indicators, supervisory switches: System Sensor, Potter Electric Signal, Reliable Automatic Sprinkler or approved substitute.
- C. Pressure switches: System Sensor, Potter Electric Signal, or approved substitute.

- D. Detectors: Central, Gamewell, Potter Electric, Viking, Simplex, or approved substitute.
- E. Gate check and indicator valves: Kennedy Valve, Milwaukee Valve, Victaulic, or approved substitute.
- F. Fire department connection: Potter Roemer, or approved substitute.
- G. Grooved products: Victaulic, or approved substitute.
- H. Sprinklers: ASCOA Fire Systems, Central Sprinkler, Firematic Sprinkler Devices, Grinnell, Globe Fire Sprinkler, Reliable Automatic Sprinkler, Star Sprinkler, Viking, or approved substitute.
- I. Fire Protection System Identification: Seton, or approved substitute.
- J. Fire stop materials: Specified Technologies, Inc., 3M, or approved substitute.
- K. Indicator Post: Viking, Mueller, Grinnell, Globe, or approved substitute.
- L. Items of the same function and performance shall be acceptable if submitted and approved in conformance with the requirements of Division I. Manufacturers shall be domestic and ISO 9000 certification is preferred.
- M. Fire protection piping, fittings, and appurtenances shall be domestic in origin. Foreign manufacturers shall not be allowed unless otherwise specified.

2.3 PIPE AND FITTINGS

- A. Wet sprinkler piping shall be UL listed, ASTM A53, Schedule 40 black steel pipe, with threaded black cast iron threaded fittings. Cast iron fitting shall be ANSI/ASME B16.4, screwed. Pipe 2 ½ -inches and larger may be thin wall ASTM A-135, A-795 (0.120 inch min. wall thickness) with welded outlets or mechanical tees (as defined in NFPA 13) with roll groove (min. 300 psi working pressure) fittings, and shall be Victaulic Firelock @ 300 psi. Dry system piping for 1" through 2" shall be galvanized Schedule 40 steel. Dry system piping for 2 1/2" through 6" shall be Schedule 10 steel pipe.
- B. Roll grooved piping utilizing Victaulic "Firelock" couplings and fittings may be used. Gaskets shall be EPDM Type A.
- C. Provide flexible groove fittings and couplings furnished with projecting rib gaskets that fit between end of the pipe and prevent liquid from settling behind rolled ends of pipe. Provide gaskets such that inner walls of the pipe are without gasket protrusions or indentations to restrict a smooth flow of liquid.
- D. Flanges shall be weld neck, Class 150 raised-face, ASTM A182 Grade F304, ANSI B16.5, Schedule to match pipe.
- E. New sprinkler drain piping for the wet pipe inspector's test assembly and main drain shall be galvanized steel, ASTM A120, with galvanized malleable iron groove (min. 300 psi WP) fittings and shall terminate at the sprinkler waste outlet.
- F. Sprinkler drain piping for the main drain shall be galvanized steel, ASTM A120, with galvanized malleable iron groove (min. 300 psi WP) fittings, and shall terminate to the exterior, approximately 60

inch above grade. Provide appurtenances as defined on drawings as well as a splash block under exterior drain outlet to prevent erosion of earth.

G. The sprinkler branch mains shall be a minimum 2 inches.

2.4 JOINT MATERIALS

- A. Solder: ANSI/ASTM B32, 95/5 alloy.
- B. Brazing: ANSI/AWS A5.8.
- C. Threaded Joint Compound: Teflon tape joint sealer, 3 mil, and shall be DuPont No. 48.

2.5 UNIONS, FLANGES, COUPLINGS

- A. Unions: 150 psi malleable iron for threaded ferrous piping.
- B. Flanges: 150 psi forged steel slip-on flanges for ferrous piping.
- C. Mechanical Grooved Couplings shall be ductile iron housing clamps to engage and lock, designed to be rigid; "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized couplings for galvanized pipe, and shall be Victaulic Firelock. Flexible couplings shall be used where seismic conditions exist.

2.6 WET ALARM VALVE

- A. Wet alarm valve shall be UL listed, FM approved, and shall include all necessary valves, gauges, fittings, nipples and appurtenances.
- B. Alarm valve shall be of standard flange dimensions conforming to ANSI B16.5, class 150 and standard grooved dimensions conforming to ANSI/AWWA C606.
- D. Alarm valve trim shall include but not be limited to retard chamber, alarm pressure switch, and water flow detector. Trim shall be UL listed and FM approved. Trim packages shall include required pipe, fittings, standard trim accessories and required gauges.
- E. Wet alarm valve shall be Victaulic FireLock Series 717R or Series 717HR High Pressure designed for hydrodynamic efficiency and 2–3¹¹ (Series 717HR) or 4–8¹¹ (Series 717R), or approved substitute.

2.7 DRY PIPE ALARM VALVE

- A. Dry alarm check shall be UL listed, FM approved and shall include all necessary valves, gauges, fittings, nipples and appurtenances.
- B. Valve shall be rated to 300 psi working pressure and be pre-trimmed, and completely assembled with all necessary components.

- C. Valve trim shall be UL listed and FM approved. Trim packages shall include required pipe, fittings, standard trim accessories and required gauges.
- D. Dry alarm valve shall be Victaulic FireLock NXT Dry Valve Series 768N, or approved substitute.

2.8 AIR COMPRESSOR

- A. Air compressor shall be single cylinder, oil free, and tank mounted, and shall be by General Air Products, or approved substitute.
- B. Pressure rating, voltage, horsepower, and model number shall be chosen by this Contractor after he/she has produced the hydraulic calculations and working drawings.

2.9 ALARM DEVICES

- A. Supervisory Switches: UL 753 for valves, electrical supervision type, SPDT (single-pole, double-throw), normally closed contacts, designed to signal controlled valve in other than fully open position, and shall be Potter Signal Model OSYSU-A.
- B. Pressure Gauges: UL 393, $3^{1}/_{2}$ $4^{1}/_{2}$ inches diameter dial, with dial range of 0-300 psig.
- C. Waterflow Indicators: UL 346 listed, FM approved, electrical-supervision, vane-type waterflow detector, rated to 250 psig (1725 kPa), and designed for horizontal or vertical installation. Include 2 SPDT (single-pole, double-throw) circuit switches to provide isolated alarm and auxiliary contacts, 10 ampere, 125 volts AC (10A, 125 V) and 2 ampere, 0-30 volts DC (2 A, 0-30 V DC); complete with factory-set, field-adjustable retard element to prevent false signals, and tamper-proof cover that sends a signal when cover is removed, and shall be Potter Signal Model WFSF-F.
- D. Pressure Switches: UL 753 listed for valves, electrical-supervision type, SPDT (single-pole, double-throw), normally closed contacts, designed to signal controlled valve in other than fully open position, and shall be Potter Signal Model OSYSU-A.
- E. All electrical devices located in electrically classified rooms shall be explosion-proof as

required.

2.10 GATE VALVES

- A. Iron body, bronze trim, rising stem, OS&Y, solid wedge, 300 psi working pressure, with supervisory switch and UL label and FM listed.
- B. Provide gate valves for isolating main service risers.

2.11 GLOBE OR ANGLE, AND POST INDICATING VALVES

- A. Iron body, bronze trim, rising stem, OS&Y, renewable composition disc, with UL label and FM listed.
- B. Post indictor valve shall be UL Listed, UL-C Listed and FM Approved and are designed to withstand up to 900 ft/lbs of operating torque, shall operate requiring 14 to 50 turns to open, and shall be ordered with all appurtenances and to open right or left per the Arlington Fire Department requirements, and shall be as manufactured by Mueller, or approved substitute. Locate as stated on floor plan.

2.12 DRAIN VALVES

A. Provide brass ball valve with cap and chain.

2.13 CHECK VALVES

A. Iron body, bronze trim, spring loaded, renewable composition disc, UL listed, or FM approved. Grooved-end check valves shall be Victaulic #717.

2.14 BUTTERFLY VALVES

A. Iron body, bronze disc and stem, resilient replaceable liner seat, 300 psi working pressure, with supervisory switch, UL listed, or FM approved, and shall be Kennedy Figure 911. Grooved-end valves shall be Victaulic # 708-W with weatherproof gear operators.

2.15 VALVE OPERATORS

- A. Provide handwheels for gate, globe or angle, and drain valves.
- B. For butterfly valves, provide gear operators for sizes 6 inches and larger. For smaller sizes provide level lock handle with toothed plate.
- C. The Owner shall be responsible for the locks and chains to secure the vales and supervisory switches.

2.16 VALVE CONNECTIONS

A. Provide valve connections to match pipe joints. Use valves of equal pipe

size.

2.17 FIRE DEPARTMENT CONNECTION

A. Provide a Storz Siamese fire department connection with brass or chrome-plated finish to match existing conditions, local fire department threads, dust cap and chain, marked AUTO. SPRINKLER

FIRE DEPARTMENT CONNECTION and shall be per the requirements of the Arlington Fire Department.

2.18 SPRINKLER HEADS

- A. Wet pipe sprinkler heads shall be UL listed, FM approved, in accordance with the local Fire Department, NFPA 13 and the local Fire Marshal.
- B. Areas with suspended ceilings may incorporate quick response (QR) Standard Spray Pendent (SSP) pendent sprinkler heads and deflectors with a temperature rating of 155° F/68° C and adjustable escutcheon plates or approved substitute. Victaulic or approved equal.
- C. Unfinished areas without ceiling may incorporate quick response (QR) Standard Spray Upright (SSU) sprinkler heads and deflectors shall be Victaulic or approved substitute.
- D. It shall be this Contractor's responsibility to verify the sprinkler head recommendations with the local Fire Marshal and the Arlington Fire Department prior to purchase or installation.
- E. Sprinkler heads shall be installed with stainless steel "head guards" around each head when installed closer than NFPA approved distances.

2.19 PIPE HANGERS, SUPPORTS, HANGER RODS, ANCHORS, AND GUIDES

- A. Unless otherwise specified, sprinkler piping shall be hung, supported, and anchored to prevent undue pipe deflection, excessive vibration, and shall protect the piping connected to the fire protection equipment from excessive loading and expansion stresses.
- B. Ensure that the pipe hangers, supports, and appurtenances used shall inhibit galvanic corrosion between dissimilar metals in the presence of water.
- C. Piping hangers, supports, and appurtenances shall be provided for a seismic event in accordance with the Massachusetts State Building Code (seismic requirements), and the NFPA.
- D. Seismic restraints shall be Holdrite, Model # EB-010.
- E. Maximum spans for materials shall be based on appropriate vendor information. If vendor information is not available, a maximum vertical deflection of 1/4 inch between supports shall be used as a support spacing criteria.
- F. Rod sizes shall be the minimum used for a single rod hanger.
- G. For hangers supporting multiple lines, rods shall not be permitted.
- H. Provide NFPA approved end restraints at the end of branch mains.
- I. Pipe supports shall be located as near as practical (2-foot maximum) to changes in direction, both horizontal and vertical.

- J. The design and selection of supports shall ensure that bare lines do not rest on concrete, suspended ceilings, or dissimilar metals so as to avoid accelerated corrosion of piping at the point of contact.
- K. Field welding shall not be permitted on stress relieved pipelines. Clamp type attachment supports shall be used or, if weld attachments are required, shall be installed at the fabricator's shop prior to stress relieving.
- L. Notify the Construction Manager if pipe support loads exceed 2000 lb. at column lines. Loads between column lines shall transfer to the column lines and shall be considered as part of the column line load. Attachments to project area's structural elements shall be mechanical. Welding to project area's steel shall be in accordance with the specific written approval and instructions of the Construction Manager.
- M. Anchors shall be secured to the project area's structural members only.
- N. Provide anchors and fasteners required for the pipe supports and for the attachment of hangers within the project areas. Bolts, anchor bolts, nuts, washers, and plates for the fire protection work shall also be included and meet NFPA Standards.

2.20 EXPANSION JOINTS

- A. Expansion joints shall be of the packless, corrugated type. Circumferential welded seams shall not be permitted in the bellows material except for seal welds which join bellows to end connections. Bellows shall be fabricated from Type 321 Stainless Steel.
- B. Expansion joints shall be suitable for the temperatures, pressures and thermal movements required and shall be fitted with sleeves.

2.21 FIRE PROTECTION SYSTEM IDENTIFICATION MATERIALS

- Unless specified otherwise, colors shall conform with ANSI/ASME A13.1 and the Owner's facility standards.
- B. Nameplates shall be laminated three-layer plastic with engraved black letters on light contrasting background color.
- C. Plastic tags shall be laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum shall be 1Y2 inch in diameter.
- D. Brass tags shall be 19-gauge, 1Y2 inch diameter with ¹/₄ inch black-filled letters over Y2 inch black-filled numbers.
- E. Stencils shall have clean cut symbols and letters of the following size:

OUTSIDE DIAMETER OF	LENGTH OF	SIZE OF
INSULATION OR PIPE	COLOR FIELD	LETTERS
3/" - 1 ¹ / ₄ "	8"	1/2"
11/2" - 2"	8"	3/"

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- F. Stencil paint shall be in accordance with the requirements of Division I.
- G. Plastic pipe markers shall be factory fabricated, flexible, semi-rigid plastic, preformed to fit around the pipe or pipe covering with minimum information indicating flow direction arrow and the fluid being conveyed.
- H. Plastic tape pipe markers shall be flexible vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.22 PENETRATIONS AND CORE DRILLING

- A. This Contractor may make neat, cored holes with the written consent and approval of the Construction Manager and the Structural Engineer. The locations of the openings shall be laid out in advance and indicated with chalk. The sizes, locations and dimensions of the openings shall be checked and verified against the equipment and general arrangement plans by the Construction Manager prior to core drilling.
- B. Submit with his bid separate unit prices for 6-inch, 8 inch, and 10 inch cored holes with specified packing.
- C. Investigate piping systems and structural conditions in the vicinity of openings prior to coring. Do not disturb existing systems unless as specified.
- D. This Contractor shall be responsible for damages to the facility and its systems from core drilling operations.
- E. Provide waterproofing membrane locking devices at floor penetrations.
- F. Waterproof pipe penetrations (not for use for slotted concrete) shall be fitted with ISO 9002 registered modular mechanical penetration seals with interlocking synthetic rubber links with nuts, bolts, pressure plates, and seal elements to form a completely watertight seal for the annular space between the pipe and the concrete opening or sleeve, and shall be Thunderline "Linkseal" Modular Mechanical Type Interlocking Links; model numbers and seal elements for the pipe sizes and types encountered.
- G. For pipes which extend from dry to potentially wet areas where vibration suppression is required between the pipe and the concrete element through which it passes (not for use for slotted concrete), the pipe penetration shall be sealed with neoprene gaskets and compression flanges to ensure a watertight seal between the pipe and the wall, etc., surrounding the pipe.
- H. Covers and escutcheon plates are not required where the pipe-wall joint are not visible in completed work except to retain the insulation in the annular space between the pipe and the opening.
- I. Penetrations through walls, floors, or ceilings to accommodate piping and appurtenances shall not increase the sound transmission class (STC) of construction. The fire rating and fire stop shall have an equal to or better fire rating than the wall or ceiling it serves.

- J. In lieu of installing sleeves in concrete and masonry, neat, cored holes may be made.
- K. Cored openings in floors shall have a tight-fitting 12-gauge galvanized sheet metal sleeve, adequately anchored and caulked to provide as watertight an installation as the cast-in-place sleeve. The sheet metal sleeves shall extend above the finished floor the same distance as specified above for the cast-in-place pipe sleeves.
- L. Sleeves shall be welded as required to resist a 200 lb. horizontal force, applied in direction at the top of the sleeve, without damage or permanent deformation of the sleeve, welds, or deck.
- M. Do not do core drilling without the written consent and approval of the Construction Manager and the Structural Engineer. The locations of the openings shall be laid out in advance and indicated with chalk. The sizes, locations and dimensions of the openings shall be checked and verified against the equipment and general arrangement plans by the Construction Manager and the Structural Engineer prior to core drilling.
- N. All exposed lines, which pass through a floor, ceiling, wall, or partition shall have a chrome escutcheon cover plate. exposed lines, which pass through a floor, ceiling, wall, or partition shall have a chrome escutcheon cover plate. The openings between the pipe and the floor, ceiling, wall, or partition shall be completely concealed, on both the inside and outside faces of the wall.
- O. The escutcheon plate shall make a snug sliding fit with the penetrating item, and the outer edge shall completely cover the opening in the structure penetrated and patchwork around the opening.
- P. Closures shall conform to applicable codes and FM requirements.
- Q. The escutcheon plate at the insulated line shall be sized to fit over the insulation, which shall be adequately protected from chafing damage at the plate. Insulation shall be carried through the sleeve with no reduction in insulation thickness.
- R. Escutcheon cover plates shall be metal, matching the siding in material and gauge, and shall be painted to match. The paint shall be obtained from the siding manufacturer or erector, and shall match as closely as possible in material, appearance, and durability of the finish on the siding, in compliance with the Owner's facility standards.
- S. In interior partitions or walls, the space between the pipe and the opening shall be packed full of glass fiber insulation, held in place by an escutcheon or a cover plate.

2.23 CATHODIC/ELECTROLYTIC PROTECTION

A Provide ASTM F-492-77 Victaulic "Clearflow" Style 47 dielectric waterway nipples to inhibit galvanic corrosion between dissimilar metals in the presence of water.

2.24 FIRE STOPPING MATERIALS

A. Provide fire stop material which will not re-emulsify, dissolve, leach, breakdown, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other

forms of moisture characteristic during and after construction. Provide firestop products that do not contain ethylene glycol.

- B. Firestop sealants shall remain sufficiently flexible to accommodate motion such as pipe vibration, thermal expansion and other normal building movement without damage to the seal.
- C. Provide through-penetration firestop systems and fire-resistive joint systems subjected to an air leakage test conducted in accordance with the Standards, ANSI/ UL1479 for penetration firestop systems. Provide T-Rating Collar Devices tested in accordance with ASTM E-814 or ANSI/UL1479 for metallic pipe penetrations per the State Building Code.
- D. Fire stop material shall be tested up to 3 hours in accordance with ASTM E 814 (UL 1479) &CAN/ULC S115, shall utilize a one-piece metal collar assembly encasing heat expanding fire barrier wrap strip ultra GS material, shall achieve up to 3-hour fire protection in tested and listed systems, and shall be 3M Fire Barrier Ultra Plastic Pipe Device, or approved substitute. System shall include 3M Ultra Fast Anchors, or approved substitute.
- E. Single component intumescent latex formulations shall contain no water-soluble intumescent ingredients capable of expanding a minimum 8 times and shall be Specified Technologies Spec Seal Series SSS Intumescent Sealant, Specified Technologies Spec Seal Series LCI Intumescent Sealant, or approved substitute.
- F. Firestop putty shall be intumescent, 100% solids, non-hardening, water resistant, butyl rubber-based putties containing no solvents or silicone compounds and shall be Specified Technologies Spec Seal Series SSP Firestop Putty, or approved substitute.
- G. Silicone sealants shall be moisture curing, single component, silicone elastomeric sealant for horizontal surfaces (pourable or non-sag) or vertical surface (nonsag), and shall be Specified Technologies Spec Seal SIL300 Silicone Firestop Sealant, Specified Technologies Spec Seal SIL300 SL Self-Leveling Silicone Firestop Sealant, or approved substitute.
- H. Silicone foam shall be multi-component, silicone-based liquid elastomers that when mixed expands and cures in place to produce a flexible, non-shrinking foam, and shall be Specified Technologies Pensil 200 Silicone Foam, or approved substitute.
- I. Fire-rated T rating collar device shall be a louvered steel collar system with synthetic aluminized polymer coolant wrap installed on metallic pipes where T ratings are required by the building code, and shall be Specified Technologies SpecSeal T-Collar Device, or approved substitute.
- J. Fire-rated closet flange gasket shall be a molded, single-component, intumescent gasket for use beneath a closet flange in floor applications and shall be Specified Technologies SpecSeal Series CF34 Closet Flange Firestop Gasket, or approved substitute.
- K. The fire rating and fire stop materials shall have an equal to or better fire rating than the walls or ceilings they serve and as allowed by code.

2.25 BACKFLOW PREVENTER

A. The backflow preventer for sprinkler water line shall incorporate a fused epoxy cast iron cast iron body; replaceable bronze seats; two independently operating spring loaded check valves; non-rising stem gate

valve shut-offs; flanged ends; and shall be Watts Series #709-NRS or approved substitute.

SPARE SPRINKLER HEADS, PARTS, AND SPECIAL TOOLS

- A. Provide a stock of spare sprinkler heads including types and ratings installed in accordance with NFPA 13, 6.2.9.5, and house in a metal sprinkler head storage cabinet. Sprinkler head wrenches and cabinets shall be manufactured by the sprinkler head manufacturer for such items.
- B. Provide to the Owner at the completion of the project a sprinkler head wrench of each style and model installed. A representative sampling of each sprinkler head style and model shall be provided to the owner and housed in a sprinkler head cabinet at or near the sprinkler riser. Sprinkler head wrenches and cabinets shall be manufactured by the sprinkler head manufacturer for such items.

2.27 GENERAL

2.26

- Provide fire protection items of the same manufacturer throughout where possible.
- B. Provide valves with manufacturer's name and pressure rating clearly marked on outside of body.
- C. Manually operated valves shall close when rotated clockwise.
- D. Unless otherwise indicated, provide valves suitable for 125 minimum psig WSP and 450° F or 200 minimum psig and 250° F.
- E. Valves shall be solder pipe ends on pipes 2-inches and smaller and located no higher than 7 feet above finish floor if possible.
- F. Provide screw to solder adapters on valves for copper tubing where applicable.
- G. The design of anchors shall be this Contractor's responsibility. The Design shall conform to accepted engineering practice, using a safety factor of $2^{1}/_{2}$ to 1.
- H. Where not fully called for in the contract documents, design of hangers and supports shall be this Contractor's responsibility. Design shall conform to accepted engineering practice, using a factor of safety of $2^{1}/_{2}$ to 1.
 - 1. Pipe supports shall be suitable for items encountered, and dimensions and loads shall be verified from approved equipment shop drawings.
 - 2. Where feasible, hangers and supports shall be designed for installation without field welding. pipe supports shall include lock washers or locking nuts to prevent vibration loosening.
 - 3. Steel members in areas of high humidity and where moisture can accumulate shall be galvanized steel.

- 4. Except where fully detailed or specified, size and quantities of hanger rods for equipment shall be as specified by the equipment manufacturer.
- I. Auxiliary framing required to support the project area's service equipment and lines (piping and similar systems) serving same, between structural frame members where direct support from structural frame members is not practicable, is included under this section. For purposes of this paragraph, auxiliary framing is defined as framing other than that called for on the architectural or structural drawings.
- J. Except as specifically noted, non-symmetrical beam and joist hangers shall not be employed.
- K. Pipe and equipment hanger rods shall have 2 nuts and lock washers or lock nuts at each end for positioning rod and hanger and for locking each in place.
- L. Hanger material and finish shall conform to the following:

Material of Supported Item	Hanger Finish
Black iron or carbon steel	Black steel
Galvanized	Galvanized

3.0 EXECUTION

3.1 CONTRACTOR RESPONSIBILITIES

- A. Coordinate items delivered, unload from delivery vehicles, safe handling and field store up to the time of installation.
- B. Carefully examine equipment and materials upon delivery. Claims that any of these materials have been received in such condition that their installation shall require procedures beyond the reasonable scope of work of this Contractor shall be considered only if presented in writing within one week of their data of delivery. Unless such claims have been submitted, completely recondition or replace damaged items.
- C. Maintain systems until final acceptance, and shall ensure adequate protection of materials during delivery, storage, installation and shutdown, and during delays pending final test of systems and equipment because of seasonal conditions.
- D. Periodic observations by the engineer/designer, Owner, or designated agent shall not be construed as supervision of actual construction, nor make either responsible for providing a safe place for performance of work of various trades or suppliers, or for visitors or occupants, or make either responsible for omission of safety devices called for by codes, ordinances, or specifications of manufacturer of equipment supplied.
- E. Establish reference points to base his/her measurements, both horizontal and vertical, and be responsible for correctly laying out the work.
- F. In the event of a discrepancy between the actual measurements and those indicated, notify the Construction Manager in writing and not proceed with work until written instructions have been issued by Construction Manager.
- G. Provide for the required equipment and material manufacturer's authorized factory personnel, on site, for intermediate milestone inspections as well as the final fire protection equipment and material inspections and start-up.
- H. It shall be this Contractor's sole responsibility to order, purchase and have on site the specified materials before they are needed and in such quantities that delays of transportation (truck, railroad, etc.), weather conditions, etc. shall not delay his work or the established project schedule.
- I. The fire rating and fire stop shall have an equal to or better fire rating than the wall or ceiling it serves.

3.2 MATERIALS AND WORKMANSHIP

A. Work shall be neat and rectilinear. Install materials and equipment as recommended by manufacturer. Installation shall operate safely and without leakage, undue wear, noise, vibration, corrosion, or water hammer. Close pipe openings to prevent obstruction and damage prior to completion.

- B. Except as specified otherwise, material and equipment shall be new. Provide supplies, appliances and connections necessary for complete and operational installation.
- C. Finish of materials, components and equipment shall be approved by the Construction Manager and shall be resistant to corrosion and weather.
- D. Owner shall not be responsible for materials, equipment or warranties before final acceptance and issuance of Certificates of Occupancies.
- E. Under no circumstances shall the indirect sprinkler waste piping terminate through a wall, spill onto a floor, or by other non-code compliant means.

3.3 CONTINUITY OF SERVICES

- A. Do not interrupt existing services without Owner's approval and as specified.
- B. Schedule interruptions in advance, according to Owner's instructions, and as specified. Submit request for interruption with methods proposed to minimum length of interruption in writing.

3.4 PREPARATION

- A. Ream pipe and tube ends. Remove burrs and sharp edges by peening or filling the edge.
- B. Clean and remove scale, dirt, mud, gravel and other foreign material on inside and outside of pipe and/or fittings before assembly.
- C. Prepare surfaces in accordance with manufacturer's installation instructions.
- D. De-grease and clean surfaces which shall receive solder or tape.
- E. Review fire protection shop drawings. Confirm location and size of equipment and openings before rough-in and installation.

3.5 PENETRATIONS

- A. Installation Testing, Listings and Approvals:
 - Installation shall meet material manufacturer's installation instructions exactly, particularly in regard to preparation of surfaces, removal of foreign materials, safety requirements, ventilation and other details of installation. Dam openings as recommended. Remove flammable materials used for damming and forming seals in fire-rated construction.
 - 2. Core drill seals shall be watertight and gas-tight and shall meet the requirements of ASTM E-119 Standard Methods of Fire Tests of Building Construction and Materials.
 - 3. Inspect sealant to ensure that installation achieves manufacturer's optimum structure and rating.

3.6 PIPING SYSTEMS, FITTINGS, AND SPRINKLER HEAD INSTALLATION

- A. This Contractor shall be responsible for the purchase/rental time for the manual and power tools, as well as the pipe cutters, lubricant, and installation kits required for the system's installation, as well as training time for this Contractor's personnel. Examine the manufacturer's recommended tool use instruction guides for the pipe installation.
- B. Screw joint steel piping up to and including 2-inch diameter. Grooved piping 2 ¹/₂-inch diameter and larger including branch connections. Provide jointing compound of polytetrafluoroethylene pipe tape for pipe threads. Apply tape to male threads only.
- C. Threaded or welded joints may be used instead of mechanical grooved joints.
- D. Group piping at common elevations whenever practical.
- E. No pipe shall be installed under a strain.
- F. Run piping horizontally and at right angles to the structure.
- G. Die cut screw joints with full cut standard taper pipe threads with Teflon tape or other non-toxic joint compound applied to male threads only.
- H. Coat threaded ends with pipe lubricant compound.
- In steel piping, main sized saddle branch connections or direct connection of branch lines to mains is permitted if main is one pipe size larger than the branch for up to 6 inch mains. Do not project branch pipes inside the main pipe.
- J. Do not penetrate building structural members.
- K. Place pipe runs in an orderly manner and to minimize obstruction to other work.
- L. Run and place sprinkler piping in concealed spaces, i.e. above finished ceilings, within soffits, etc.
- M. Place pendent sprinkler heads in the center of suspended ceiling tiles with respect to other disciplines and provide piping "return bend drops" (arm overs) to achieve design objective.
- N. Apply strippable tape or paper cover to ensure concealed sprinkler head cover plates do not receive field finishes.
- O. Install piping, hangers, sprinkler heads, fittings, drain connections and inspectors test stations in strict accordance with the requirements of NFPA 13.
- P. Furnish and install piping straight, plumb, and as direct as possible. Form right angles on parallel lines with building walls.
- Q. Piping shall be accurately cut to measurements established in the field and worked into place without springing or forcing.

R. Keep piping free from scale and dirt. Protect open pipe ends whenever work is suspended during construction to prevent foreign bodies entering and lodging there.

S. Screwed Joints:

- 1. All pipe and fittings with screwed ends shall have I.P.S. thread cut clean and true in conformance with ANSI Specifications B2.1 for taper threads.
- 2. Fittings shall be screwed up close to shoulders of male threads. Lampwich, cord, wool or other similar materials shall not be used in making threaded joints.
- 3. All screwed pipe joints, except where specified otherwise, shall be made up with Teflon tape or other non-toxic joint compound, applied to male threads only.
- T. Pipe jointed with mechanical grooved couplings shall be joined by an approved combination of couplings, gaskets and grooves. Grooves shall be dimensionally compatible with the couplings. Mechanical couplings shall be by one manufacturer.
- U. Flanged joints shall be made using proper gaskets and bolts according to latest NFPA regulations.
- V. Provide escutcheon plates for sprinkler piping passing through floors, walls and ceilings of a onepiece or split type. Plates shall be securely anchored in place with set screws or other approved means.
- W. Seal coring penetrations to achieve fire resistance equivalent to fire separation required.
- X. All sprinkler pipe and fittings shall be installed so that system can drain thoroughly. piping shall be arranged so that the system drains to the main drain valve, spilling onto grade, in accordance with the requirements of the authorities having jurisdiction as well as the Owner. Pipe shall be straightened before installation to prevent pockets which could interfere with proper drainage.
- Y. Sprinkler pipes shall be installed level unless otherwise indicated. Trapped piping shall be drained in accordance with NFPA standards.
- Z. Install piping to conserve the project area's space and not interfere with use of space.
- AA. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting.
- BB. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- CC. Piping shall not be installed below ceiling grid elevation unless otherwise noted.
- DD. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors in accordance with the requirements of the architectural specifications.
- EE. Unless otherwise noted, field paint exposed piping to comply with the Owner's facility standards, whichever is more stringent.
- FF. Vertical piping:

- Secure vertical piping to keep in alignment and to support the weight of the pipe and its contents. Support mains at the base and at each floor interval. Approved metal clamps or hangers as specified shall be used.
- 2. If vertical piping is to stand free of support and no structural element is available for support and stability during construction, secure piping in position by means of adequate but temporary stakes or braces fastened to pipe.

GG. Horizontal piping, suspended:

- 1. Support horizontal piping and fittings to maintain alignment and prevent sagging or grade reversal.
 - Support each length of pipe by an approved hanger located not more than 18-inches from each joint, pipe turn, and fitting.
- 2. Support terminal ends of horizontal runs or branches and each change of direction or alignment with an approved hanger.
- II. Sprinkler heads shall be located a minimum of 4 inch from wall.
- JJ. All sprinkler heads shall be installed with a "bird cage" in areas where the sprinkler head is too close to the ceiling insulation.

3.7 VALVE INSTALLATION

- A. Provide shut-off valves where indicated and specified and in following locations:
 - Control valves.
 - Special hazard areas.
- B. Provide shut-off valves where indicated and specified and in following locations:
- C. Provide gate valves for shut-off or isolating service.
- D. Where approved, butterfly valves may be used instead of gate valves.
- E. Provide drain valves at main shut-off valves and at low points of piping.
- F. Install valves to permit easy operation, replacement, and repair.
- G. All valves shall be labeled, i.e. Main Control, Inspector's Test, etc.

3.8 PIPE HANGERS, SUPPORTS, HANGER RODS, ANCHORS, AND GUIDES INSTALLATION

A. The fire protection headers shall be rigidly hung or attached to the structural steel members only to prevent movement caused by the pressure discharge. Piping shall not be supported by electrical cable trays, mechanical ductwork, etc. or other non-structural members. Pipe hangers shall be supported

from open web joists or trusses at the "panel points" (the bottom or top part of the "V") only for greater structural integrity.

- B. Support vertical piping at each floor.
- C. Pipe hangers and supports shall be located as near as practical (2-foot maximum) to changes in direction and at the ends of each branch line.
- Restraining clips/straps shall be installed at the ends of branch piping and where required by the NFPA.
- E. Unless otherwise specified, support horizontal steel piping as follows:

Pipe Size (Inches)	Rod Size	Spacing (Feet)
Up to 2"	3/8"	6
2-1/2" to 3-1/2"	1/2"	12
4" to 5"	5/8"	12
6"	3/4"	12

- F. Install hangers to ensure that dissimilar metals do not come in contact with each other.
- G. Horizontal pipe and fittings five (5) inches and larger shall be sway-braced to prevent horizontal movement. Sway bracing shall be done at each branch opening or change in direction by suitable methods to the Construction Manager, to prevent movement or joint separation.
- H. Hanger rods shall be set vertically plumb.
- I. Structural steel shoes for anchors, guides and resting supports shall be set in place under pipe and offset adjusted.
- J. Rod hangers and spring assemblies shall be shipped completely assembled.
- K. Anchors and guides shall be located to restrain movement at changes in pipe direction and where necessary to control the pipe direction and movement. Provide two guides on each side of expansion elements, with approximately 10 pipe diameters between guides.
- L. During hydrostatic testing of lines supported by springs, counterweights, etc., temporary rigid supports, or blocking shall be installed to prevent excessive strain on piping and equipment and overloading of spring devices.
- M. Shipping rods on expansion joints shall be removed after installation of joints.
 - 1. Piping shall be properly anchored and guided before testing.
 - 2. Where tie rods are used, care shall be taken to see that they are locked in proper position before testing and readjusted after test.
- N. Compression spring hangers and supports shall be shipped to job assembled with spring compressed.

- O. Adjust the spring in the field to the cold load. Cold setting shall take place after hydro test and mechanical completion but prior to final alignment of associated equipment.
- P. All inspector's test drains, and main drains shall be fitted with threaded rods and pipe clamps securely fastened to the adjacent wall to prevent vibration and damage during discharge.

3.9 SEISMIC RESTRAINT INSTALLATION

- A. All equipment shall be anchored, bolted or welded to the structure. Equipment shall be positively attached to the building structure.
- B. All fire protection piping with a nominal diameter of 2-1/2 inch and larger shall be braced and/or anchored to the building structure to resist seismic loads.
- C. Exceptions: fire protection piping suspended by individual hangers 6-inches or less in length, as measured from the top of the pipe to the attachment point to the structure, do not require bracing provided that hangers on a piping run meet this requirement.
- D. Suspended equipment shall be braced in both directions. When suspended by rods, rod stiffeners shall be used when I/r >200. Suspended fire protection equipment weighing less than 50 pounds shall not require bracing.
- E. All piping systems requiring bracing shall be braced both laterally and longitudinally. Lateral bracing shall be spaced at a maximum of 40 feet. Longitudinal bracing shall be spaced at a maximum of 80 feet. Braces shall be installed at or as close as practical to a hanger location. Trapeze supported piping requiring bracing shall have the individual pipes attached to the trapeze member only at the braced location. Pipe risers through cored holes shall require riser clamps at each floor on the top of the slab with the riser clamp attached securely to the slab.
- F. Bracing or anchoring of piping and equipment may be attached to: (a) Building structural steel by an approved means; (b) Upper truss chords of bar joists; (c) Load bearing walls; (d) Floor slabs by an approved means; and (e) Cast in place inserts in concrete structures.
- G. Equipment or a length of pipe shall not be braced to parts of the building that may respond differently during seismic loading.

3.10 ESCUTCHEON PLATE INSTALLATION

- A. Install escutcheons around exposed piping which passes through finished walls and floors.
- B. The outer edge of the escutcheon plates shall completely cover the opening in the structure penetrated and patchwork around the opening.

3.11 FLASHING INSTALLATION

A. Flash and counter-flash where the fire protection piping and appurtenances or systems pass through weather or water-proofed walls and floors in accordance with the requirements of the architectural specifications.

3.12 EQUIPMENT INSTALLATION

- A. Alarm check valves shall be mounted vertically five (5) feet above floor level. Install with necessary trim, main drain, pressure gauges on service and sprinkler sides.
- B. Install switches in position locations that are accessible for service.

3.13 WELDING

- A. Visually inspect welding while welders are making welds and again after work is complete. After welding is complete, hand or power wire brush welds and clean before check inspection. Inspect welds under light for surface cracking, porosity, and slag inclusions, excessive roughness, unfilled craters, gas pockets, undercuts, overlaps, size and insufficient throat and concavity. Correct deficiencies until approved by the Construction Manager.
- B. Welding of joints shall be done by certified welders qualified for welding in accordance with latest recommended practices of the American Welding Society.

3.14 WIRING

A. Provide valve controls and pull station and interlock wiring in accordance with the requirements of Division 16, except work specifically shown on the electrical drawings or described under the electrical specifications.

3.15 HYDRAULIC CALCULATIONS

- A. Hydraulic calculations as performed by this Contractor shall bear the stamp and signature of approval of a currently licensed registered fire protection engineer retained by said Contractor. The hydraulic calculations shall also bear the stamp of approval of the authority having jurisdiction and the Fire Marshall prior to installation of portion of the fire protection systems and prior to submission for approval.
- B. Pipe friction losses shall be calculated for piping over one foot in length. Vertical lengths less than one foot shall be included for elevation purposes only.
- C. Flows shall be calculated to the nearest whole gallon per minute.
- D. Velocity pressure may be neglected.
- E. Velocities in piping shall not exceed 25 feet per second.
- F. A 10-psig cushion shall be maintained between the water supply pressure and the system total pressure demand.

- G. Perform current hydrant flow tests to obtain a basis for his hydraulic calculations.
 - 1. State and/or Local Fire Marshal shall witness and approval tests.
 - 2. The Water Department shall approve tests.
 - 3. Final calculations shall be based on flow data derived from flow tests performed by this Contractor at the hydrants installed on the site.

3.16 SPRINKLER SERVICE CONNECTION

A. Work under this contract shall commence as shown on the fire protection systems floor

plan. 3.17 TESTING AND FLUSHING

- A. All testing and flushing shall be performed in accordance with NFPA and the Arlington Fire Department's applicable standards.
- B. Provide labor, materials, and instruments necessary for the completion of tests under the observation of the local authorities, the Department of Environmental Health and Safety, and the designated inspectors.
- C. Unless specified otherwise or directed by the local Fire Department, test his systems to 200-psi for two (2) hours. Confirm these numbers with the local Fire Chief prior to commencing with tests.
- D. Testing, balancing and adjusting shall not relieve guarantee requirements.
- E. Provide services of qualified personnel, equipment and apparatus required to perform tests.
- F. Make tests of this work as required by the Construction Manager during the progress of work to demonstrate strength, durability and fitness of installation.
- G. Sufficient notice shall be given to the Construction Manager to allow his representative to be present during tests. leaks detected shall be fixed by replacing defective materials and the test shall be continued until systems are free of leaks and proven tight under test pressures.
- H. Hydrostatically test piping in accordance with requirements of NFPA. leaks detected shall be fixed by replacing defective materials and the test shall be continued until systems are free of leaks and proven tight under test pressures.
- I. Maintain test pressure by means of a small pump, with main controlling gate shut to avoid water damage in the event of a break.
- J. Thoroughly flush interior system in accordance with requirements of NFPA. Flush exterior system through blow-off prior to making connection to interior valve and/or piping. Notify Construction Manager of readiness for flushing.

- K. Submit evidence of approval by insuring agency for work under this section, prior to acceptance of work by owner.
- L. Before date of acceptance, furnish Owner with certificates of testing and inspection indicating approval of local authorities having jurisdiction and conformance with the requirements of the Contract Documents.

3.18 COMMISSIONING OF SYSTEMS

- A. The Owner at his option, shall check the completed installation either sequentially as different parts are completed, or when the entire installation is complete.
- B. Prior to the Owner's checking of part or of this installation, submit a letter signed by an officer of this Contracting company or the Construction Manager stating:
 - 1. The individual is an officer of the company.
 - 2. The individual has personally inspected the installations.
 - Inspection dates.
 - 4. The installation is complete and tested and ready to be inspected by the Owner and the local authorities having jurisdiction, and that required test reports have been submitted.
- C. Arrange for an officer of the contracting company, the Construction Manager, and the local authorities having jurisdiction to witness the listed tests, as well as to other test witnesses that may be required. At the conclusion of each such tests, submit a letter signed by the officer stating:
 - 1. The individual is an officer of the company.
 - 2. The individual has personally witnessed the tests (provide name).
 - Test dates.
 - 4. Test results as compared to specified performance.
 - 5. List the name, title and company affiliation of those witnessing the test.
- D. All piping systems shall be tested and shall require letters.
- E. Explain to the Owner that the Owner is responsible for maintaining heat within the building at 40° F or higher.
- F. Explain to the Owner that the Owner is responsible for maintaining sprinkler systems per NFPA.

3.19 CHARTS AND SPARE SPRINKLERS

A. Provide glass-mounted instruction charts on wall near new or existing valves, with description of operation of system and maintenance procedures. Locate cabinets where directed by local authorities having jurisdiction.

3.20 SYSTEM IDENTIFICATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
- B. Install plastic and brass tags using 8-inch meter seals, brass "S" hooks, or corrosive-resistant brass jack chain.
- Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers completely around pipe in accordance with manufacturer's instructions.
- E. Identify equipment with stencil painting. Small devices may be identified with plastic tags. Equipment nameplates and tags shall include the project symbol as listed in the equipment schedules on the drawings.
- F. Identify control panels and major control components outside of the panels with plastic nameplates.
- G. Identify valves in main and branch piping with tags.
- H. Identify piping, concealed or exposed, with plastic pipe markers. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install markers in clear view and align with the axis of the piping. Locate identification not less than every 10 feet on straight runs, including risers and drops, adjacent to each new or existing valve as required, at "T's", at each side of penetrations of the structure or enclosure, and at each obstruction.

END OF SECTION 21 00 10

SECTION 220001 - GENERAL CONDITIONS FOR PLUMBING WORK

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

- A. The General Conditions of the Contract and General Requirements shall be part of this section unless otherwise specifically excluded.
- B. Examine all Drawings and all other Sections of the Specifications for requirements and provisions affecting the work of this Section.
- C. Provide materials, labor and equipment together with incidental items not specifically shown or specified which are required by plumbing industry standards for a complete, safe and properly operating system. Risers are diagrammatic and may not represent all offsets, fittings or work required. Include all work as required to interface with existing systems and necessary for proper installation and operation.
- D. This contractor shall visit the job site and verify the existing conditions and piping prior to estimating and commencing this work.
- E. Removal and handling or contact with asbestos and hazardous material is prohibited. Abatement of any known asbestos containing materials shall be performed prior to commencement of work.
- F. This contractor shall be responsible for obtaining and paying for all permits. This contractor shall also be responsible for arranging and conducting tests and inspections at the appropriate intervals, prior to covering or concealment of systems.
- G. Prior to start of project plumber to submit work schedule to property management company for reserved access to each unit. One week notice required for unscheduled access. Close coordination is required between plumber, heating contractor, Project Manager's contractor and the property management company.

1.2 DESCRIPTION OF WORK

- A. As part of this project, provide labor, materials, and equipment necessary to complete the work of this section, including but not limited to the following:
 - 1. Installation of new sink and faucet.
 - 2. Relocation/extension of existing Domestic Cold and Hot water piping to new sink location.
 - 3. Relocation/extension of existing Sanitary waste & vent piping to new sink location.

1.3 SUBMITTALS

A. Where required, this contractor shall provide shop drawing submittals, including but not limited to: the piping, hangers, supports, insulation, etc. To the owner's authorized representative for approval prior to purchase or installation.

- B. Material and equipment requiring shop drawing submittals shall include but not limited to:
 - 1. Sink
 - 2. Faucet
 - 3. Piping
 - 4. Pipe insulation
 - 5. Ball Valves
 - 6. Sanitary Piping

1.4 REFERENCES

A. It shall be understood that the specifications and drawings for PLUMBING work are complimentary and are to be taken together for a complete interpretation of the PLUMBING work except that indications on the drawings, which refer to and individual element of work, take precedence over the specifications where they conflict with the same.

1.5 REGULARTORY REQUIREMENTS

- A. All plumbing work shall be provided in accordance with the Massachusetts state and local building codes, the ma state plumbing code, all applicable local codes, ordinances, amendments and the local authorities having jurisdiction.
- B. Where provisions of the contract documents conflict with any codes, rules or regulations, the latter shall govern. Where the contract requirements are in excess of applicable codes, rules, or regulations, the contract provisions shall govern unless the engineer rules otherwise.
- C. Request inspections from the authorities having jurisdiction, obtain all permits and pay for all fees and inspection certificates as applicable and/or required. All permits and certificates shall be turned over to the owner's representative at the completion of the work. Copies of permits shall be given to the resident engineer prior to the start of work.
- D. Unless otherwise specified or Indicated, materials, workmanship, and equipment performance shall conform with the latest edition of the following standards, codes, specifications, requirements, and regulations:
 - 1. State building Code
 - 2. State PLUMBING Code
 - 3. International Mechanical Code (IMC)
 - 4. International Energy Conservation Code (IECC)
 - 5. National Fire Protection Association (NFPA)
 - 6. Local Town Regulations and By-Laws
 - 7. Underwriters Laboratories Inc (UL)
 - 8. National Electrical Manufacturers Association (NEMA)
 - 9. American National Standards institute (ANSI)
 - 10. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE).

E. All PLUMBING work shall meet or exceed any other state or local codes and/or authorities having jurisdiction including all other standards indicated herein.

1.6 SURVEYS AND MEASUREMENTS

A. Base all required measurements, both horizontal and vertical, on reference points established by the contractor and be responsible for the correct layout of PLUMBING work. In the event of a discrepancy between actual measurements and those indicated, notify the Engineer in writing, and do not proceed with the work required until written instructions have been issued by the Engineer.

1.7 COORDINATION

- A. All work shall be coordinated through the Project Manager. Contractor shall provide a minimum of 48 hours advance notice for access into residents' apartments for any work that is to occur within occupied units. Failure to provide adequate notice may result in denial of access.
- B. Contractor shall submit a work schedule to the Project Manager of what units they will be working in and when. Failure to submit a schedule may result in limited or no access to parts of the building.
- C. Protect all materials and work of other trades from damage which may be caused by the PLUMBING work and repair all damages without extra cost to the owner.

1.8 INSTALLATION REQUIREMENTS

- A. The Arrangement of all work shown on the drawings is diagrammatic only and indicates the minimum requirements for the work. Conditions at the building including actual measurements shall determine the details of the installation.
- B. This contractor shall be responsible through field investigations for determining the exact size, service location and elevations of all piping to be removed, altered, or tapped before work is scheduled. This contractor shall reconnect all piping after tie-in work is complete to restore existing systems to the proper operating conditions.
- C. Check the Architectural plans and specifications (if any) before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Engineer for their determination prior to proceeding with the work.
- D. All plumbing systems and appurtenances shall be provided in accordance with the manufacturer's recommendations and as approved by the property management company so as not to interfere with the new or existing systems or the architectural finishes. All systems shall be completed, cleaned, inspected, tested and made ready for use.

1.9 TYPICAL DETAILS

A. Typical details where shown on the drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the drawings, which in many cases are diagrammatic only. But with the intention that such details shall be incorporated in full.

Any alternate method proposed for use by the contractor shall have the prior approval of the Engineer.

1.10 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of the mechanical and electrical equipment at the site.

1.11 PORTABLE AND DETATCHABLE PARTS

A. Contractors shall retain in their possession all portable and/or detachable parts and portions of materials, devices, equipment etc. necessary for the proper operation and maintenances of the mechanical and electrical systems until final completion of the work, at which time they shall be handed over to the Owner's representative.

1.12 RECORD DRAWINGS, PROJECT CLOSEOUT

- A. Comply with requirements specified in DIVISION 01
- B. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer make and model numbers of final equipment installation.

1.13 GUARANTEE/WARRANTY

- A. Guarantee work of this section in writing for one year following the date of beneficial occupancy by the user agency. The Guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to engineer's satisfaction and correct damaged cause in making necessary repairs and replacements under guarantee within contract price.
- B. In addition to guarantee requirements of Division 01 and subparagraph "A" above, obtain written equipment and material warranties offered in manufacturers published data without exclusion or limitation, in User Agency's name.
- C. Upon receipt of notice from Owner's representative of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this contractor without any reimbursement.
- D. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Engineer.
- E. Provide 24-hour service beginning on the date the project is accepted by Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to the owner. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to engineer and Owner's representative's approval. Submit name and phone number that will be answered on a 24-hour basis each day of the week, for the duration of the service.

- F. Submit copies of equipment and material warranties to Engineer before final payment.
- G. At the end of guarantee period, transfer manufacturer's equipment and material warranties still in force to the User Agency.
- H. This paragraph shall not be interpreted to limit the Owner's right under applicable codes and laws under this contract.
- I. The other sections of this specification may specify warranty requirements that exceed those of this paragraph. Those paragraphs will govern.
- J. Use of systems provided under this section for temporary services and facilities shall not constitute final acceptance of work by Owner's Representative and shall not initiate the guarantee period.
- K. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to the Owner's Representative's satisfaction, advise the engineer in writing. Describe efforts to rectify the situation and provide analysis of the problem. Engineer will direct a course of action.

1.14 OPERATING, INSTRUCTION AND MAINTANANCE MANUALS

- A. Refer to Division 01 for submittal procedures pertaining to operating and maintenances manuals.
- B. Each copy of the approved operating and maintenance manual shall contain copies of approved shop drawings, equipment literature, cuts, bulletins, details, equipment and engineering data sheets and type written instructions relative to the care and maintenance for the operation of the equipment, all properly indexed. Each Manual shall have the following minimum table of contents:

1. Introduction:

- a. Explanation of manual and its purpose and use.
- b. Description of the PLUMBING systems
- c. Safety precautions and necessary for equipment
- d. Illustrations, Schematics and diagrams.
- e. Installation drawing.

2. Maintenance:

- a. Maintenances and Lubrication instructions
- b. Replacement charts
- c. Trouble shooting charts for equipment components.
- d. Testing instructions for each typical component.
- e. Two typed sets of instructions for ordering spare parts. Each set shall include name, price, telephone number and address of where they may be obtained.
- 3. Manufacturer's Literature for the equipment for which shop drawings have been submitted and approved.

1.15 QUALITY ASSURANCE

- A. The requirements of the State Building Code and local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.
- B. All work shall comply with the latest editions of the codes referenced herein.
- C. Follow manufacturer's directions for articles furnished, in addition to directions shown on drawings or specified herein.
- D. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to owner.
- E. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.
- F. Equipment and materials shall:
 - 1. Where normally subject to Underwriters Laboratory Inc listing or labeling services, be so listed or labeled.
 - 2. Be without blemish or defect.
 - 3. Not be used for temporary purposes.
 - 4. Be in accordance with the latest applicable NEMA standards.
 - Be products which will meet with the acceptance of all authorities having jurisdiction over the
 work. Where such acceptance is contingent upon having the products examined, tested and
 certified by Underwriters or other recognized testing laboratory, the product shall be so
 examined, tested and certified.
- G. For items which are to be installed but not purchased as part of the PLUMBING work, the work shall include:
 - 1. The coordination of their delivery.
 - 2. Their unloading from delivery trucks driven into any point on the property line at grade level.
 - Their safe handling and field storage up to the time of permanent placement in the project.
 - 4. The correction of any damage, defacement, or corrosion to which they may have been subjected. Replacement if necessary shall be coordinated with contractor who originally purchased the item.
 - 5. Their field make-up and internal wiring as may be necessary for their proper operation.
 - 6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastening necessary to adapt them to architectural and structural conditions.

1.16 DELIVERY, STORAGE AND HANDLING

- A. All materials for the work of this section shall be delivered, stored and handled as to preclude damage of any nature. Manufacture red materials shall be delivered and stored in their original containers, plainly marked with the products manufacturer's name. Materials in broken containers or in packages showing watermarks or other evidence of damage shall not be used and be removed from the site.
- B. PLUMBING Contractor is responsible for the storing materials and equipment in a dry and secure location indoors. Materials and equipment shall not be left in residents basements unless stored in a locked box or other secure means.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Product specifications are written in such a manner so as to specify what materials may be used in a particular location or application and therefore do not indicate what is not acceptable or suitable for a particular location or application. As an example: non-metallic sheathed cable is not specified; therefore, it is not acceptable.
- B. For the purpose of establishing a standard of quality and not for purpose of limiting completion, the basis of this specification is upon specified models and types of equipment and materials, as manufacture red by specified manufacturers.
- C. In all cases, standard cataloged materials and systems have been selected. In the case of systems, the system components shall be from a single source regularly engaged in supplying such systems. A proposed system made up of a collection of various manufacturers products will be unacceptable.
- D. Where specifications list manufacturer's names and/or "as approved" or "Equal approved by engineer", other manufacturers equipment will be considered if equipment meets specification requirements and has all features of the specified items as are considered essential by the Engineer.
- E. All materials shall be new, and UL listed.

PART 3 - EXECUTION

3.1 TRASH AND WASTE DISPOSAL

A. PLUMBING contractor shall keep worksite clean and organized. Demolished items, scrap, wrapping, boxes and any other by-product of the work being done shall be removed from the site at the end of each day unless arrangements with the Project Manager has been made for dumpster services.

- B. Trash and other waste generated by project shall not be put into any community dumpsters or trash bins unless otherwise approved by the Project Manager..
- C. Any dust, shavings, or other materials left on surfaces shall be swept up or vacuumed so that the area is returned to its existing condition.

END OF SECTION 220000

SECTION 220523.12 - BALL VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Brass ball valves.
- 2. Bronze ball valves.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 and NSF 372.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded end valves.
 - 2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 3. ASME B16.18 for solder-joint connections.
 - 4. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
 - 1. Handlever: For quarter-turn valves smaller than NPS 4.
- H. Valves in Insulated Piping:
 - 1. Include 2-inch stem extensions.

- 2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
- 3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRASS BALL VALVES

- A. Brass Ball Valves, Two-Piece with Full Port and Brass Trim, Threaded or Soldered Ends:
 - 1. Description:
 - a. Standard: MSS SP-110 or MSS SP-145.
 - b. CWP Rating: 600 psig.
 - c. Body Design: Two piece.
 - d. Body Material: Forged brass.
 - e. Ends: Threaded and soldered.
 - f. Seats: PTFE.
 - g. Stem: Brass.
 - h. Ball: Chrome-plated brass.
 - i. Port: Full.
- B. Brass Ball Valves, Two-Piece with Full Port and Brass Trim, Press Ends:
 - 1. Description:
 - a. Standard: MSS SP-110 or MSS SP-145.
 - b. CWP Rating: Minimum 200 psig.
 - c. Body Design: Two piece.
 - d. Body Material: Forged brass.
 - e. Ends: Press.
 - f. Press Ends Connection Rating: Minimum 200 psig.
 - g. Seats: PTFE or RPTFE.
 - h. Stem: Brass.
 - i. Ball: Chrome-plated brass.
 - j. Port: Full.
 - k. O-Ring: Buna-N or EPDM.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.

3.2 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. Select valves with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valveend option is indicated in valve schedules below.
 - 2. For Steel Piping, NPS 2 and Smaller: Threaded ends.

3.3 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Brass ball valves, two-piece with full port and brass trim. Provide with solder or press connection-joint ends.

END OF SECTION 220523.12

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Metal pipe hangers and supports.
- 2. Trapeze pipe hangers.
- 3. Thermal hanger-shield inserts.
- 4. Fastener systems.
- 5. Pipe-positioning systems.
- 6. Equipment supports.

B. Related Requirements:

- 1. Section 220516 "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.
- 2. Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment" for vibration isolation devices.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.
- B. Pipe Welding Qualifications: Qualify procedures and operators according to "2015 ASME Boiler and Pressure Vessel Code, Section IX."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

- 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
- 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

2.2 METAL PIPE HANGERS AND SUPPORTS

- A. Copper Pipe and Tube Hangers:
 - 1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
 - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 THERMAL HANGER-SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: ASTM C552, Type II cellular glass with 100-psig or ASTM C591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type anchors, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 - 1. Indoor Applications: Zinc-coated steel.
 - 2. Outdoor Applications: Stainless steel.

2.6 PIPE-POSITIONING SYSTEMS

A. Description: IAPMO PS 42 positioning system composed of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-carbon-steel shapes.

2.8 MATERIALS

- A. Aluminum: ASTM B221.
- B. Carbon Steel: ASTM A1011/A1011M.
- C. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size, or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A36/A36M carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:

- 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete, after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
- 2. Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Pipe-Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms, and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

- 1. Attach clamps and spacers to piping.
 - a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating Below Ambient Air Temperature: Use thermal hanger-shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
- 2. Install MSS SP-58, Type 39 protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
- 3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
- 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
- 5. Thermal Hanger Shields: Install with insulation of same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work.

3.5 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

- A. Touchup: Clean field welds and abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded, shoppainted areas on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780/A780M.

3.7 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.

- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- F. Use padded hangers for piping that is subject to scratching.
- G. Use thermal hanger-shield inserts for insulated piping and tubing.
- H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 - 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 - 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
 - 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
 - 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
 - 12. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 - 13. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 14. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
 - 15. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction occurs.
 - 16. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction occurs.
 - 17. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction occurs but vertical adjustment is unnecessary.
 - 18. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction occurs and vertical adjustment is unnecessary.

- 19. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation, in addition to expansion and contraction, is required.
- I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Turnbuckles (MSS Type 13): For adjustment of up to 6 inches for heavy loads.
 - 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 - 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11 split pipe rings.
 - 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 - 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 - 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 - 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 - 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 - 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 - 6. C-Clamps (MSS Type 23): For structural shapes.
 - 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 - 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 - 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 - 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 - 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to
 - 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 - 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 - 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 - 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

- L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 - 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 - 3. Thermal Hanger-Shield Inserts: For supporting insulated pipe.
- M. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 - Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 - 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
 - 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 - 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
 - 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 - 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
 - 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- N. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- O. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- P. Use pipe-positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

SECTION 220548.13 - VIBRATION CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Elastomeric isolation pads.
- 2. Elastomeric isolation mounts.
- 3. Restrained elastomeric isolation mounts.
- Pipe-riser resilient supports.
- 5. Resilient pipe guides.
- 6. Elastomeric hangers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Delegated-Design Submittal: For each vibration isolation device.
 - 1. Include design calculations for selecting vibration isolators.

PART 2 - PRODUCTS

2.1 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

- 1.
- 2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
- 3. Size: Factory or field cut to match requirements of supported equipment.
- 4. Pad Material: Oil and water resistant with elastomeric properties.
- 5. Surface Pattern: Smooth pattern.
- 6. Infused nonwoven cotton or synthetic fibers.
- 7. Load-bearing metal plates adhered to pads.

2.2 ELASTOMERIC ISOLATION MOUNTS

- A. Double-Deflection, Elastomeric Isolation Mounts:
 - 1. Mounting Plates:
 - a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.

- b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.
- 2. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.3 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

- A. Restrained Elastomeric Isolation Mounts:
 - 1. Description: All-directional isolator with restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 - a. Housing: Cast-ductile iron or welded steel.
 - b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 PIPE-RISER RESILIENT SUPPORT

- A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch-thick neoprene.
 - 1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
 - 2. Maximum Load Per Support: 500 psig on isolation material providing equal isolation in all directions.

2.5 RESILIENT PIPE GUIDES

- A. Description: Telescopic arrangement of two steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch-thick neoprene.
 - 1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.6 ELASTOMERIC HANGERS

- A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:
 - 1. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
 - 2. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

Audrey O'Hagan Architects Project No. 228.00 May 25, 2023

PART 3 - EXECUTION

3.1 VIBRATION CONTROL DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points.
- B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

END OF SECTION 220548.13

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Red.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information plus emergency notification instructions.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

- B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.

PART 3 - EXECUTION

3.1 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.2 PIPE LABEL INSTALLATION

- A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

- 1. Domestic Water Piping
 - a. Background: Safety green.
 - b. Letter Colors: White.

END OF SECTION 220553

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic hot-water piping.
 - 2. Domestic recirculating hot-water piping.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail attachment and covering of heat tracing inside insulation.
 - 3. Detail insulation application at pipe expansion joints for each type of insulation.
 - 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 5. Detail removable insulation at piping specialties, equipment connections, and access panels.
 - 6. Detail application of field-applied jackets.
 - 7. Detail application at linkages of control devices.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Special-Shaped Insulation: ASTM C552, Type III.
 - 2. Preformed Pipe Insulation without Jacket: Comply with ASTM C552, Type II, Class 1.
 - 3. Preformed Pipe Insulation with Factory-Applied ASJ-SSL: Comply with ASTM C552, Type II, Class 2.
 - 4. Factory fabricate shapes according to ASTM C450 and ASTM C585.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.
 - 1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

2.3 MASTICS AND COATINGS

- A. Materials shall be compatible with insulation materials, jackets, and substrates.
- B. Vapor-Retarder Mastic: Water based; suitable for indoor use on below-ambient services.

- 1. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions.
- 2. Service Temperature Range: Minus 20 to plus 180 deg F.
- 3. Comply with MIL-PRF-19565C, Type II, for permeance requirements.
- 4. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
 - 1. Water-Vapor Permeance: ASTM E96, greater than 1.0 perm at manufacturer's recommended dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Color: White.

2.4 SEALANTS

- A. Joint Sealants for Cellular-Glass Products:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Permanently flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 100 to plus 300 deg F.
 - 4. Color: White or gray.
- B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: White.

2.5 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.

2.6 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 11.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.7 SECUREMENTS

A. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

- 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at [2 inches] [4 inches] o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Cleanouts.

3.3 PENETRATIONS

- A. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

- 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
- 4. Seal jacket to wall flashing with flashing sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- D. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive
 - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

- 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
- 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
- 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
- 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
 - Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 - When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 - 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 - 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 - 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF CELLULAR-GLASS INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
 - 1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 - 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 - 3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
 - 4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

- 1. Install preformed pipe insulation to outer diameter of pipe flange.
- 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
- 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
- 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

- 1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
- 2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

- 1. Install preformed sections of cellular-glass insulation to valve body.
- 2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
- 3. Install insulation to flanges as specified for flange insulation application.

3.6 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below.
 - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

3.8 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Underground piping.
 - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.9 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Hot, Cold and Recirculated Hot Water: Insulation shall be the following:
 - 1. Fiberglass ASJ SSL: 1.0 inches thick

END OF SECTION 220719

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Copper tube and fittings.
- 2. Piping joining materials.
- 3. Transition fittings.
- 4. Dielectric fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.3 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372.

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- C. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal seating surfaces.
 - 4. Solder-joint or threaded ends.
- D. Copper, Brass, or Bronze Pressure-Seal-Joint Fittings:

- 1. Fittings: wrought-copper with EPDM O-ring seal in each end. Sizes NPS 2-1/2and larger with stainless steel grip ring and EPDM O-ring seal.
- 2. Minimum 200-psig working-pressure rating at 250 deg F.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

- 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
- 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.
- E. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- F. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F 493.
- G. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656. .
- H. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.4 TRANSITION FITTINGS

- A. General Requirements:
 - 1. Same size as pipes to be joined.
 - 2. Pressure rating at least equal to pipes to be joined.
 - 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Plastic-to-Metal Transition Fittings:
 - 1. Description:
 - a. CPVC or PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
 - b. One end with threaded brass insert and one solvent-cement-socket or threaded end.
- D. Plastic-to-Metal Transition Unions:
 - 1. Description:

- a. CPVC or PVC four-part union.
- b. Brass or stainless-steel threaded end.
- c. Solvent-cement-joint or threaded plastic end.
- d. Rubber O-ring.
- e. Union nut.

2.5 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 - Standard: ASSE 1079.
 - 2. Pressure Rating: 125 psig minimum at 180 deg F.
 - 3. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
 - 1. Standard: ASSE 1079.
 - 2. Factory-fabricated, bolted, companion-flange assembly.
 - 3. Pressure Rating: 125 psig minimum at 180 deg F.
 - 4. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install shutoff valve immediately upstream of each dielectric fitting.
- D. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."
- E. Install domestic water piping level and plumb.
- F. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- G. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- H. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

- I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- J. Install piping to permit valve servicing.
- K. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- L. Install piping free of sags and bends.
- M. Install fittings for changes in direction and branch connections.
- N. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.
- G. Joint Construction for Solvent-Cemented Plastic Piping: Clean and dry joining surfaces. Join pipe and fittings according to the following:

- 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
- 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
- 3. PVC Piping: Join according to ASTM D 2855.
- H. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.3 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.4 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for hangers, supports, and anchor devices in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install hangers for copper tubing and piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- C. Support horizontal piping within 12 inches of each fitting.
- D. Support vertical runs of copper tubing and piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
 - 2. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.7 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Piping Inspections:
 - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
 - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.

- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- f. Prepare reports for tests and for corrective action required.
- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.9 ADJUSTING

- A. Perform the following adjustments before operation:
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open shutoff valves to fully open position.
 - 3. Open throttling valves to proper setting.
 - 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
 - 5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
 - 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 - 7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
 - 8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
 - 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 - 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.

- 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
- c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
- d. Repeat procedures if biological examination shows contamination.
- e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.11 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Unions may be used for aboveground piping joints unless otherwise indicated.
- C. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:
 - 1. Hard copper tube, ASTM B 88, Type L; Cast or wrought-copper, solder-joint fittings; and soldered or pressed joints.
 - 2. Hard copper tube, ASTM B 88, Type L; Cast or wrought-copper pressure-seal-joint fittings; and pressure-sealed joints.

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions.

1.2 SUMMARY

A. Section Includes:

- 1. Vacuum breakers.
- 2. Backflow preventers.
- 3. Water pressure-reducing valves.
- 4. Balancing valves.
- 5. Temperature-actuated, water mixing valves.
- 6. Strainers.
- 7. Drain valves.
- 8. Water-hammer arresters.
- 9. Trap-seal primer valves.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For domestic water piping specialties.
 - 1. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61.

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B. Comply with NSF 372 for low lead.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers
 - Standard: ASSE 1001.
 - 2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
 - 3. Body: Bronze.
 - 4. Inlet and Outlet Connections: Threaded.
 - 5. Finish: Rough bronze.
- B. Hose-Connection Vacuum Breakers
 - 1. Standard: ASSE 1011.
 - 2. Body: Bronze, nonremovable, with manual drain.
 - 3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
 - 4. Finish: Rough bronze.

2.4 BACKFLOW PREVENTERS

- A. Intermediate Atmospheric-Vent Backflow Preventers
 - 1. Standard: ASSE 1012.
 - 2. Operation: Continuous-pressure applications.
 - 3. Size: NPS 1/2.
 - 4. Body: Bronze.
 - 5. End Connections: Solder joint.
 - 6. Finish: Rough bronze.
- B. Reduced-Pressure-Principle Backflow Preventers
 - 1. Standard: ASSE 1013.
 - 2. Operation: Continuous-pressure applications.
 - 3. Pressure Loss: 12 psig maximum, through middle third of flow range.
 - 4. Body: Bronze for NPS 2 and smaller; [cast iron with interior lining that complies with AWWA C550 or that is FDA approved] [steel with interior lining that complies with AWWA C550 or that is FDA approved] [stainless steel] for NPS 2-1/2 and larger.
 - 5. End Connections: Threaded for NPS 2 and smaller; [flanged] <Insert type> for NPS 2-1/2 and larger.
 - 6. Configuration: Designed for [horizontal, straight-through] [vertical-inlet, horizontal-center-section, and vertical-outlet] [vertical] <Insert configuration> flow.
 - 7. Accessories
 - Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
 - b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
 - c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators

- 1. Standard: ASSE 1003.
- 2. Pressure Rating: Initial working pressure of 150 psig.
- 3. Body: Bronze with chrome-plated finish for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
- 4. Valves for Booster Heater Water Supply: Include integral bypass.
- 5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.6 BALANCING VALVES

A. Memory-Stop Balancing Valves

- 1. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
- 2. Pressure Rating: 400-psig minimum CWP.
- 3. Size: NPS 2 or smaller.
- 4. Body: Copper alloy.
- 5. Port: Standard or full port.
- 6. Ball: Chrome-plated brass.
- 7. Seats and Seals: Replaceable.
- 8. End Connections: Solder joint or threaded.
- 9. Handle: Vinyl-covered steel with memory-setting device.

2.7 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices

- 1. Standard: ASSE 1017.
- 2. Pressure Rating: 125 psig.
- 3. Type: Thermostatically controlled, water mixing valve.
- 4. Material: Bronze body with corrosion-resistant interior components.
- 5. Connections: Threaded inlets and outlet.
- 6. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
- 7. Tempered-Water Setting: 108 deg F.
- 8. Valve Finish: Rough bronze.

2.8 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers

- 1. Pressure Rating: 125 psig minimum unless otherwise indicated.
- 2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
- 3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
- 4. Screen: Stainless steel with round perforations unless otherwise indicated.
- 5. Perforation Size:
 - a. Strainers NPS 2 and Smaller: 0.033 inch.

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6. Drain: Factory-installed, hose-end drain valve.

2.9 DRAIN VALVES

- A. Ball-Valve-Type, Hose-End Drain Valves
 - 1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
 - 2. Pressure Rating: 400-psig minimum CWP.
 - 3. Size: NPS 3/4.
 - 4. Body: Copper alloy.
 - 5. Ball: Chrome-plated brass.
 - 6. Seats and Seals: Replaceable.
 - 7. Handle: Vinyl-covered steel.
 - 8. Inlet: Threaded or solder joint.
 - 9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.10 TRAP-SEAL PRIMER DEVICE

- A. Supply-Type, Trap-Seal Primer Device
 - 1. Standard: ASSE 1018.
 - 2. Pressure Rating: 125 psig minimum.
 - 3. Body: Bronze.
 - 4. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
 - 5. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
 - 6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.
- B. Drainage-Type, Trap-Seal Primer Device
 - 1. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
 - 2. Size: NPS 1-1/4 minimum.
 - 3. Material: Chrome-plated, cast brass.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Backflow Preventers: Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 - 1. Locate backflow preventers in same room as connected equipment or system.
 - 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
 - 3. Do not install bypass piping around backflow preventers.
- B. Water Regulators: Install with inlet and outlet shutoff valves. Install pressure gauges on inlet and outlet.

- C. Balancing Valves: Install in locations where they can easily be adjusted.
- D. Temperature-Actuated, Water Mixing Valves: Install with check stops or shutoff valves on inlets and with shutoff valve on outlet.
 - 1. Install cabinet-type units recessed in or surface mounted on wall as specified.
- E. Supply-Type, Trap-Seal Primer Device: Install with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- F. Drainage-Type, Trap-Seal Primer Device: Install as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.
- C. Comply with requirements for grounding equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

3.3 IDENTIFICATION

- A. Plastic Labels for Equipment: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 - 1. Pressure vacuum breakers.
 - 2. Intermediate atmospheric-vent backflow preventers.
 - 3. Reduced-pressure-principle backflow preventers.
 - 4. Double-check, backflow-prevention assemblies.
 - 5. Carbonated-beverage-machine backflow preventers.
 - 6. Dual-check-valve backflow preventers.
 - 7. Reduced-pressure-detector, fire-protection, backflow-preventer assemblies.
 - 8. Double-check, detector-assembly backflow preventers.
 - 9. Water pressure-reducing valves.
 - 10. Automatic water shutoff valves.
 - 11. Calibrated balancing valves.
 - 12. Primary, thermostatic, water mixing valves.
 - 13. Manifold, thermostatic, water mixing-valve assemblies.
 - 14. Photographic-process, thermostatic, water mixing-valve assemblies.
 - 15. Primary water tempering valves.
 - 16. Outlet boxes.
 - 17. Hose stations.
 - 18. Supply-type, trap-seal primer valves.
 - 19. Trap-seal primer systems.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to

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identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Test each pressure vacuum breaker according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. ABS pipe and fittings.
- 2. PVC pipe and fittings.
- 3. Specialty pipe fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 WARRANTY

A. Listed manufacturers to provide labeling and warranty of their respective products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.

2.2 PIPING MATERIALS

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 ABS PIPE AND FITTINGS

- A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.
- B. Solid-Wall ABS Pipe: ASTM D 2661, Schedule 40.
- C. Cellular-Core ABS Pipe: ASTM F 628, Schedule 40.

D. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.

2.4 PVC PIPE AND FITTINGS

- A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.
- B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- C. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.
- D. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- E. Adhesive Primer: ASTM F 656.
- F. Solvent Cement: ASTM D 2564.

2.5 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 - 1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 - 2. Unshielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1173.
 - b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. End Connections: Same size as and compatible with pipes to be joined.
 - d. Sleeve Materials:
 - 1) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 2) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
 - 3. Shielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1460.
 - b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. End Connections: Same size as and compatible with pipes to be joined.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
 - 1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
 - 2. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
 - 1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
 - 2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
 - a. Straight tees, elbows, and crosses may be used on vent lines.
 - 3. Do not change direction of flow more than 90 degrees.
 - 4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
 - a. Reducing size of waste piping in direction of flow is prohibited.
- K. Lay buried building waste piping beginning at low point of each system.
 - 1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
 - 2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

- 3. Maintain swab in piping and pull past each joint as completed.
- L. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Sanitary Waste Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- M. Install aboveground ABS piping according to ASTM D 2661.
- N. Install aboveground PVC piping according to ASTM D 2665.
- O. Install underground ABS and PVC piping according to ASTM D 2321.
- P. Plumbing Specialties:
 - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
 - Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 2. Install drains in sanitary waste gravity-flow piping.
 - a. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- Q. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.2 JOINT CONSTRUCTION

- A. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
 - 3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendixes.

3.3 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in ODs.
 - 2. In Waste Drainage Piping: Unshielded, nonpressure transition couplings.

3.4 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment." Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."
 - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 - 2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 - 3. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
 - 4. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 5. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 6. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 7. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Install hangers for steel soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Install hangers for ABS and PVC piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- E. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- F. Support vertical runs of steel soil piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- G. Support vertical runs of ABS and PVC piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect waste and vent piping to the following:
 - 1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.

- 3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
- 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
- 5. Comply with requirements for cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- 6. Equipment: Connect waste piping as indicated.
 - a. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.6 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping.
- B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
 - a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.

- a. Expose work that was covered or concealed before it was tested.
- 3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
 - a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
 - b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
 - c. Inspect joints for leaks.
- 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.
 - a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg.
 - b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
 - c. Air pressure must remain constant without introducing additional air throughout period of inspection.
 - d. Inspect plumbing fixture connections for gas and water leaks.
- 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
- 6. Prepare reports for tests and required corrective action.

3.8 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed ABS and PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.
- E. Repair damage to adjacent materials caused by waste and vent piping installation.

3.9 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:
 - 1. ABS pipe, ABS socket fittings, and solvent-cemented joints.
 - 2. PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 3. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.
- C. Aboveground, vent piping NPS 4 and smaller shall be any of the following:

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- 1. ABS pipe, ABS socket fittings, and solvent-cemented joints.
- 2. PVC pipe, PVC socket fittings, and solvent-cemented joints.
- 3. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.
- D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:
 - 1. [ABS pipe, ABS socket fittings, and solvent-cemented joints.
 - 2. PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 3. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cleanouts.

1.2 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

- A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14 for plastic sanitary waste piping specialty components.

2.2 CLEANOUTS

- A. Plastic Floor Cleanouts:
 - 1. Size: Same as connected branch.
 - 2. Body: PVC.
 - 3. Closure Plug: PVC.
 - 4. Riser: Drainage pipe fitting and riser to cleanout of same material as drainage piping.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 - 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 - 2. Locate at each change in direction of piping greater than 45 degrees.
 - 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 - 4. Locate at base of each vertical soil and waste stack.

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- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.
- E. Install vent caps on each vent pipe passing through roof.
- F. Install wood-blocking reinforcement for wall-mounting-type specialties.

3.2 CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 LABELING AND IDENTIFYING

- A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
 - 1. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 230000 - GENERAL CONDITIONS FOR MECHANICAL WORK

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. Provide Labor, materials and equipment necessary to complete the work of this section, including but not limited to the following:
 - 1. Removal of existing supply and return ductwork throughout office spaces as shown in drawings.
 - 2. Removal of existing supply and return hot water piping throughout office spaces as shown in drawings.
 - 3. Removal of existing duct mounted hot water coils and related controls throughout office spaces as shown in drawings.
 - 4. Installation of new supply and return ductwork throughout office spaces as shown in drawings.
 - 5. Installation of new supply and return hot water piping throughout office spaces as shown in drawings.
 - 6. Installation of new duct mounted hot water coils and related controls throughout office spaces as shown in drawings.
 - 7. System cleaning (of new ductwork prior to balancing).
 - 8. Testing and Balancing
- B. Contractor shall provide all materials and equipment necessary for the Installation of the following materials and equipment:
 - 1. Metal Ductwork and fittings
 - 2. Flexible Ductwork (limited to 60 inches in length)
 - 3. Hot Water Supply and Return Copper piping
 - 4. Duct mounted hot water coils
 - 5. Duct insulation
 - 6. Pipe insulation
 - 7. Thermostats and control devices
 - 8. Registers and Diffusers
- C. Perform work and provide material and equipment as shown on drawings and as specified or indicated in this section of the specifications. Completely coordinate work of this section with work of other trades and provide a complete and fully functional installation.
- D. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with specifications, drawings, addenda, and change orders; all of which are part of the Contract Documents.

1.2 SUBMITTALS

- A. Comply with requirements in General Notes located on drawing M0.1
- B. Material and equipment requiring shop drawing submittals shall include but not limited to:
 - 1. Hot Water Duct Coils
 - 2. Supply Diffusers
 - 3. Return Grilles
 - 4. Pipe Insulation
 - 5. Duct Insulation
 - 6. Thermostats
 - 7. Modulating Control Valve

1.3 REFERENCES

- A. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item in the drawings or specifications for electrical work carries with it the instruction to furnish, install and connect the item as part of the MECHANICAL work, regardless of whether or not this instruction is explicitly stated.
- B. It shall be understood that the specifications and drawings for MECHANICAL work are complimentary and are to be taken together for a complete interpretation of the MECHANICAL work except that indications on the drawings, which refer to and individual element of work, take precedence over the specifications where they conflict with the same.

1.4 REGULARTORY REQUIREMENTS

- A. Comply with all applicable federal and state laws, and all local codes, by-laws and ordinances.
- B. Where provisions of the contract documents conflict with any codes, rules or regulations, the latter shall govern. Where the contract requirements are in excess of applicable codes, rules, or regulations, the contract provisions shall govern unless the engineer rules otherwise.
- C. Request inspections from the authorities having jurisdiction, obtain all permits and pay for all fees and inspection certificates as applicable and/or required. All permits and certificates shall be turned over to the owner's representative at the completion of the work. Copies of permits shall be given to the resident engineer prior to the start of work.
- D. Unless otherwise specified or Indicated, materials, workmanship, and equipment performance shall conform with the latest edition of the following standards, codes, specifications, requirements, and regulations:
 - 1. State building Code
 - 2. State Mechanical Code
 - 3. State Engery Conservation Code
 - 4. National Fire Protection Association (NFPA)
 - 5. Local Town Regulations and By-Laws
 - 6. Underwriters Laboratories Inc (UL)

- 7. National Electrical Manufacturers Association (NEMA)
- 8. American National Standards institute (ANSI)
- 9. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE).
- E. All MECHANICAL work shall meet or exceed any other state or local codes and/or authorities having jurisdiction including all other standards indicated herein.

1.5 SURVEYS AND MEASUREMENTS

A. Base all required measurements, both horizontal and vertical, on reference points established by the contractor and be responsible for the correct layout of MECHANICAL work. In the event of a discrepancy between actual measurements and those indicated, notify the Engineer in writing, and do not proceed with the work required until written instructions have been issued by the Engineer.

1.6 COORDINATION

- A. Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades to meet architectural requirements.
- B. Work shall be performed in cooperation with other trades on the project and so scheduled to allow speedy and efficient completion of the work.
- C. Furnish to other trades advance information on locations and sizes of all frames, sleeves and openings needed for their work, and furnish information and shop drawings necessary to permit trades effected by the work to install same properly and without delay.
- D. If any MECHANICAL work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the MECHANICAL trades involved without extra cost to the owner.
- E. Where conflicts or potential conflicts exist, and engineering guidance is desired, submit a sketch of proposed resolution to the Engineer for review.
- F. Protect all materials and work of other trades from damage which may be caused by the MECHANICAL work, and repair all damages without extra cost to the owner.

1.7 MECHANICAL AND ELECTRICAL COORDINATION

- A. Heating and Ventilation contractor shall furnish and install various electrical items relating to the heating and ventilation equipment and control apparatus. The electrical contractor shall be required to connect power wiring to this equipment unless otherwise noted.
- B. The heating and Ventilation and Electrical Contractors shall have coordinated their respective portions of the work, as well as the electrical characteristics of the heating and ventilating equipment

- C. All power wiring and local disconnect switches will be provided by the electrical contractor for the line voltage power. All control and interlocking wiring shall be the responsibility of the heating and Ventilation Contractor.
- D. 120V and above power wiring sources extended and connected to heating and ventilation control panels, transformers, and switches hall be the responsibility of the electrical Contractor. All low voltage thermostats, zone valves, and any switch wiring shall be the responsibility of the Heating and Ventilation Contractor.
- E. Temperature control and equipment wiring shall be installed by the Heating and Ventilating Contractor.

1.8 INSTALLATION REQUIREMENTS

- A. The Arrangement of all work shown on the drawings is diagrammatic only and indicates the minimum requirements for the work. Conditions at the building including actual measurements shall determine the details of the installation. All work shall be laid out and installed so as to require the least amount of cutting and patching.
- B. Check the Architectural plans and specifications (if any) before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Engineer for their determination prior to proceeding with the work.
- C. Coordinate infill of existing penetrations in floors and walls with G.C. and Architect after removal of ductwork and piping or for the installation of new ductwork and piping.

1.9 TYPICAL DETAILS

A. Typical details where shown on the drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the drawings, which in many cases are diagrammatic only. But with the intention that such details shall be incorporated in full. Any alternate method proposed for use by the contractor shall have the prior approval of the Engineer.

1.10 CORING, DRILLING

A. Core, cut and/or drill all small holes 4.5" diameter or less in walls and floors required for the installation of sleeves and supports for MECHANICAL work.

1.11 SUPPLEMENTARY SUPPORTING STEEL

- A. Provide all supplementary steel work required for mounting or supporting equipment and materials.
- B. Steel work shall be firmly connected to the building construction as required.

- C. Steel work shall be of sufficient strength to allow only minimum deflection in conformity with manufacturers published requirements
- D. All supplementary steel work shall be installed in a neat and workmanlike manner parallel to the floor, wall and ceiling construction. All turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.
- E. All manufactured steel parts and fittings shall be galvanized.

1.12 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of the mechanical and electrical equipment at the site.

1.13 PORTABLE AND DETATCHABLE PARTS

A. Contractors shall retain in their possession all portable and/or detachable parts and portions of materials, devices, equipment etc. necessary for the proper operation and maintenances of the mechanical and electrical systems until final completion of the work, at which time they shall be handed over to the Owner's representative.

1.14 RECORD DRAWINGS, PROJECT CLOSEOUT

- A. Comply with requirements specified in DIVISION 01
- B. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer make and model numbers of final equipment installation.

1.15 GUARANTEE/WARRANTY

- A. Guarantee work of this section in writing for one year following the date of beneficial occupancy by the user agency. The Guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to engineer's satisfaction and correct damaged cause in making necessary repairs and replacements under guarantee within contract price.
- B. In addition to guarantee requirements of Division 01 and subparagraph "A" above, obtain written equipment and material warranties offered in manufacturers published data without exclusion or limitation, in User Agency's name.
- C. Upon receipt of notice from Owner's representative of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this contractor without any reimbursement.
- D. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Engineer.

- E. Provide 24-hour service beginning on the date the project is accepted by Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to the owner. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to engineer and Owner's representative's approval. Submit name and phone number that will be answered on a 24-hour basis each day of the week, for the duration of the service.
- F. Submit copies of equipment and material warranties to Engineer before final payment.
- G. At the end of guarantee period, transfer manufacturer's equipment and material warranties still in force to the User Agency.
- H. This paragraph shall not be interpreted to limit the Owner's right under applicable codes and laws under this contract.
- I. The other sections of this specification may specify warranty requirements that exceed those of this paragraph. Those paragraphs will govern.
- J. Use of systems provided under this section for temporary services and facilities shall not constitute final acceptance of work by Owner's Representative and shall not initiate the guarantee period.
- K. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to the Owner's Representative's satisfaction, advise the engineer in writing. Describe efforts to rectify the situation and provide analysis of the problem. Engineer will direct a course of action.
- 1.16 OPERATING, INSTRUCTION AND MAINTANANCE MANUALS
 - A. Refer to Division 23 for submittal procedures pertaining to operating and maintenances manuals.
 - B. Each copy of the approved operating and maintenance manual shall contain copies of approved shop drawings, equipment literature, cuts, bulletins, details, equipment and engineering data sheets and type written instructions relative to the care and maintenance for the operation of the equipment, all properly indexed. Each Manual shall have the following minimum table of contents:

1. Introduction:

- a. Explanation of manual and its purpose and use.
- b. Description of the MECHANICAL systems
- c. Safety precautions and necessary for equipment
- d. Illustrations, Schematics and diagrams.
- e. Installation drawing.

2. Maintenance:

- a. Maintenances and Lubrication instructions
- b. Replacement charts
- c. Trouble shooting charts for equipment components.

- d. Testing instructions for each typical component.
- e. Two typed sets of instructions for ordering spare parts. Each set shall include name, price, telephone number and address of where they may be obtained.
- 3. Manufacturer's Literature for the equipment for which shop drawings have been submitted and approved.

1.17 QUALITY ASSURANCE

- A. The requirements of the State Building Code and local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.
- B. All work shall comply with the latest editions of the codes referenced herein.
- C. Follow manufacturer's directions for articles furnished, in addition to directions shown on drawings or specified herein.
- D. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to owner.
- E. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.
- F. Equipment and materials shall:
 - 1. Where normally subject to Underwriters Laboratory Inc listing or labeling services, be so listed or labeled.
 - 2. Be without blemish or defect.
 - 3. Not be used for temporary purposes.
 - 4. Be in accordance with the latest applicable NEMA standards.
 - Be products which will meet with the acceptance of all authorities having jurisdiction over the
 work. Where such acceptance is contingent upon having the products examined, tested and
 certified by Underwriters or other recognized testing laboratory, the product shall be so
 examined, tested and certified.
- G. For items which are to be installed but not purchased as part of the MECHANICAL work, the work shall include:
 - 1. The coordination of their delivery.
 - 2. Their unloading from delivery trucks driven into any point on the property line at grade level.
 - 3. Their safe handling and field storage up to the time of permanent placement in the project.
 - 4. The correction of any damage, defacement, or corrosion to which they may have been subjected. Replacement if necessary shall be coordinated with contractor who originally purchased the item.

- 5. Their field make-up and internal wiring as may be necessary for their proper operation.
- 6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastening necessary to adapt them to architectural and structural conditions.

1.18 DELIVERY, STORAGE AND HANDLING

A. All materials for the work of this section shall be delivered, stored and handled as to preclude damage of any nature. Manufacture red materials shall be delivered and stored in their original containers, plainly marked with the products manufacturer's name. Materials in broken containers or in packages showing watermarks or other evidence of damage shall not be used and be removed from the site.

PART 2 - PRODUCTS

2.1 Manufacturers

- A. Product specifications are written in such a manner so as to specify what materials may be used in a particular location or application and therefore do not indicate what is not acceptable or suitable for a particular location or application. As an example: non-metallic sheathed cable is not specified; therefore, it is not acceptable.
- B. For the purpose of establishing a standard of quality and not for purpose of limiting completion, the basis of this specification is upon specified models and types of equipment and materials, as manufacture red by specified manufacturers.
- C. In all cases, standard cataloged materials and systems have been selected. In the case of systems, the system components shall be from a single source regularly engaged in supplying such systems. A proposed system made up of a collection of various manufacturers products will be unacceptable.
- D. Where specifications list manufacturer's names and/or "as approved" or "Equal approved by engineer", other manufacturers equipment will be considered if equipment meets specification requirements and has all features of the specified items as are considered essential by the Engineer.
- E. All materials shall be new, and UL listed.
- F. All equipment and accessories shall produce no more than 35 NC (noise level) within occupied office spaces.
- G. All wall mounted thermostats shall be secured within tamper-proof enclosures with lock and key.

PART 3 - EXECUTION

3.1 Not Applicable.

END OF SECTION 230001

SECTION 230523.12 - BALL VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Bronze ball valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded-end valves.
 - 2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 3. ASME B16.18 for solder-joint connections.
 - 4. ASME B31.1 for power piping valves.
 - 5. ASME B31.9 for building services piping valves.
- C. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- D. Refer to HVAC valve schedule articles for applications of valves.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
 - 1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
 - 2. Handlever: For quarter-turn valves smaller than NPS 4.
- H. Valves in Insulated Piping:
 - 1. Include 2-inch stem extensions.

- 2. Extended operating handle of nonthermal-conductive material, and protective sleeves that allow operation of valves without breaking the vapor seals or disturbing insulation.
- 3. Memory stops that are fully adjustable after insulation is applied.
- I. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

- A. Bronze Ball Valves, Two-Piece with Full Port and Bronze or Brass Trim, Threaded Ends:
 - 1. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE.
 - h. Stem: Bronze.
 - i. Ball: Chrome-plated brass.
 - j. Port: Full.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.

3.2 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified SWP classes or CWP ratings are unavailable, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- B. Select valves with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends, Compression type (i.e. pro press type) or where solder-joint valve-end option or press-end option is indicated in valve schedules below.
 - 2. For Steel Piping, NPS 2 and Smaller: Threaded ends.

John A. Bishop Elementary School Renovation Project Arlington Facilities Department 25 Columbia Road, Arlington, MA 02474

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3.3 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller: Brass ball valves, two piece, with bronze trim, full port, threaded, solder or press connection-joint ends.

END OF SECTION 230523.12

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Metal pipe hangers and supports.
- 2. Trapeze pipe hangers.
- 3. Thermal-hanger shield inserts.
- 4. Fastener systems.
- 5. Equipment supports.

B. Related Requirements:

- Section 230516 "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
- 2. Section 230548 "Vibration and Seismic Controls for HVAC" for vibration isolation devices.
- 3. Section 233113 "Metal Ducts" for duct hangers and supports.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
 - 1. Trapeze pipe hangers.
 - 2. Equipment supports.
- C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of trapeze hangers.
 - 2. Include design calculations for designing trapeze hangers.
- D. Welding certificates.

1.3 QUALITY ASSURANCE

- A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design trapeze pipe hangers and equipment supports.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 - 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

2.2 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
 - 3. Nonmetallic Coatings: Plastic coated, or epoxy powder-coated.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Copper Pipe and Tube Hangers:
 - 1. Description: MSS SP-58, Types 1 through 58, copper-plated steel, factory-fabricated components.
 - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-plated steel.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psi minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psi minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless-steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MATERIALS

- A. Aluminum: ASTM B 221.
- B. Carbon Steel: ASTM A 1011/A 1011M.
- C. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- D. Stainless Steel: ASTM A 240/A 240M.
- E. Grout: ASTM C 1107/C 1107M, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Non-staining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-58. Install hangers and attachments as required to properly support piping from building structure.
- D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled strut systems.
- E. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- F. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

G. Pipe Stand Installation:

- 1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
- 2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb.
- H. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- K. Install lateral bracing with pipe hangers and supports to prevent swaying.
- L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

- M. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

O. Insulated Piping:

- 1. Attach clamps and spacers to piping.
 - Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
- 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
- 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
- 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
- 5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
- 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780/A 780M.

3.7 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

- E. Use carbon-steel pipe hangers and supports and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 - 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 - 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
 - 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
 - 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
 - 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 - Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 - 14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 - 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
 - 17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
 - Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
 - 19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is unnecessary.
 - 20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is unnecessary.

- 21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 - 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 - 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 - 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 - 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 - 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 - 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 - 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 - 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 - 6. C-Clamps (MSS Type 23): For structural shapes.
 - 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 - 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 - 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 - 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 - 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to
 - 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 - 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 - 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 - 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 - 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 - 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 - 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 - 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 - 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 - 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
 - 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 - 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
 - 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- O. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- P. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe labels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 PIPE LABEL INSTALLATION

- A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- B. Pipe Label Color Schedule:
 - 1. Heating Water Piping: Black letters on a safety-orange background.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Constant-volume air systems.
 - 2. Balancing Hydronic Piping Systems:
 - a. Constant-flow hydronic systems.

1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- F. TDH: Total dynamic head.

1.3 ACTION SUBMITTALS

A. TAB Report: Documentation indicating that Work complies with ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

1.4 INFORMATIONAL SUBMITTALS

A. Certified TAB reports.

1.5 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC.
 - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
 - 2. TAB Technician: Employee of the TAB specialist and certified by AABC as a TAB technician.

- B. TAB Specialists Qualifications: Certified by NEBB.
 - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB.
 - 2. TAB Technician: Employee of the TAB specialist and certified by NEBB as a TAB technician.
- C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 - Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.

- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.
- L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures for balancing the systems.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:

- a. Duct systems are complete with terminals installed.
- b. Volume, smoke, and fire dampers are open and functional.
- c. Clean filters are installed.
- d. Fans are operating, free of vibration, and rotating in correct direction.
- e. Variable-frequency controllers' startup is complete and safeties are verified.
- f. Automatic temperature-control systems are operational.
- g. Ceilings are installed.
- h. Windows and doors are installed.
- i. Suitable access to balancing devices and equipment is provided.

2. Hydronics:

- a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
- b. Piping is complete with terminals installed.
- c. Water treatment is complete.
- d. Systems are flushed, filled, and air purged.
- e. Strainers are pulled and cleaned.
- f. Control valves are functioning per the sequence of operation.
- g. Shutoff and balance valves have been verified to be 100 percent open.
- h. Pumps are started and proper rotation is verified.

- i. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
- j. Variable-frequency controllers' startup is complete and safeties are verified.
- k. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
 - Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- Check for airflow blockages.

- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - Measure total airflow.
 - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
 - 2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report artificial loading of filters at the time static pressures are measured.
 - 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 - 4. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 - 5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
 - 1. Measure airflow of submain and branch ducts.
 - 2. Adjust submain and branch duct volume dampers for specified airflow.
 - 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
 - 1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 - 2. Measure inlets and outlets airflow.

- 3. Adjust each inlet and outlet for specified airflow.
- 4. Re-measure each inlet and outlet after they have been adjusted.

3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.
- B. Prepare schematic diagrams of systems' "as-built" piping layouts.
- C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:
 - 1. Check liquid level in expansion tank.
 - 2. Check highest vent for adequate pressure.
 - 3. Check flow-control valves for proper position.
 - 4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
 - 5. Verify that motor starters are equipped with properly sized thermal protection.
 - 6. Check that air has been purged from the system.

3.7 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

- A. Adjust pumps to deliver total design gpm.
 - 1. Measure total water flow.
 - a. Position valves for full flow through coils.
 - b. Measure flow by main flow meter, if installed.
 - c. If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
 - 2. Measure pump TDH as follows:
 - a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - c. Convert pressure to head and correct for differences in gage heights.
 - d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
 - e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
 - 3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
- B. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - 1. Measure flow in main and branch pipes.
 - 2. Adjust main and branch balance valves for design flow.

- 3. Re-measure each main and branch after all have been adjusted.
- C. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 - 1. Measure flow at terminals.
 - 2. Adjust each terminal to design flow.
 - 3. Re-measure each terminal after it is adjusted.
 - 4. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 - 5. Perform temperature tests after flows have been balanced.
- D. For systems with pressure-independent valves at terminals:
 - 1. Measure differential pressure and verify that it is within manufacturer's specified range.
 - 2. Perform temperature tests after flows have been verified.
- E. For systems without pressure-independent valves or flow-measuring devices at terminals:
 - 1. Measure and balance coils by either coil pressure drop or temperature method.
 - 2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
- F. Verify final system conditions as follows:
 - 1. Re-measure and confirm that total water flow is within design.
 - 2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 - 3. Mark final settings.
- G. Verify that memory stops have been set.

3.8 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 - 2. Air Outlets and Inlets: Plus or minus 10 percent.
 - 3. Heating-Water Flow Rate: Plus or minus 10 percent.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.9 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 - 2. Include a list of instruments used for procedures, along with proof of calibration.
 - 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:

- 1. Pump curves.
- 2. Fan curves.
- 3. Manufacturers' test data.
- 4. Field test reports prepared by system and equipment installers.
- 5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 - 1. Title page.
 - 2. Name and address of the TAB specialist.
 - 3. Project name.
 - 4. Project location.
 - 5. Architect's name and address.
 - 6. Engineer's name and address.
 - 7. Contractor's name and address.
 - 8. Report date.
 - 9. Signature of TAB supervisor who certifies the report.
 - 10. Table of Contents with the total number of pages defined for each section of the report.

 Number each page in the report.
 - 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 - 12. Nomenclature sheets for each item of equipment.
 - 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 - 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 - 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
 - 1. Quantities of outdoor, supply, return, and exhaust airflows.
 - 2. Water and steam flow rates.
 - 3. Duct, outlet, and inlet sizes.
 - 4. Pipe and valve sizes and locations.
 - 5. Terminal units.
 - 6. Balancing stations.
 - 7. Position of balancing devices.
- E. Apparatus-Coil Test Reports:

1. Coil Data:

- a. System identification.
- b. Location.
- c. Coil type.
- d. Number of rows.
- e. Fin spacing in fins per inch o.c.
- f. Make and model number.
- g. Face area in sq. ft..
- h. Tube size in NPS.
- i. Tube and fin materials.
- j. Circuiting arrangement.
- 2. Test Data (Indicated and Actual Values):
 - a. Airflow rate in cfm.
 - b. Average face velocity in fpm.
 - c. Air pressure drop in inches wg.
 - d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
 - e. Return-air, wet- and dry-bulb temperatures in deg F.
 - f. Entering-air, wet- and dry-bulb temperatures in deg F.
 - g. Leaving-air, wet- and dry-bulb temperatures in deg F.
 - h. Water flow rate in gpm.
 - i. Water pressure differential in feet of head or psig.
 - j. Entering-water temperature in deg F.
 - k. Leaving-water temperature in deg F.
 - I. Refrigerant expansion valve and refrigerant types.
 - m. Refrigerant suction pressure in psig.
 - n. Refrigerant suction temperature in deg F.
 - o. Inlet steam pressure in psig.
- F. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
 - 1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft..
 - g. Indicated airflow rate in cfm.
 - h. Indicated velocity in fpm.
 - i. Actual airflow rate in cfm.
 - j. Actual average velocity in fpm.
 - k. Barometric pressure in psig.
- G. Air-Terminal-Device Reports:
 - 1. Unit Data:
 - a. System and air-handling unit identification.
 - b. Location and zone.

- c. Apparatus used for test.
- d. Area served.
- e. Make.
- f. Number from system diagram.
- g. Type and model number.
- h. Size.
- i. Effective area in sq. ft..
- 2. Test Data (Indicated and Actual Values):
 - a. Airflow rate in cfm.
 - b. Air velocity in fpm.
 - c. Preliminary airflow rate as needed in cfm.
 - d. Preliminary velocity as needed in fpm.
 - e. Final airflow rate in cfm.
 - f. Final velocity in fpm.
 - g. Space temperature in deg F.
- H. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
 - 1. Unit Data:
 - a. System and air-handling-unit identification.
 - b. Location and zone.
 - c. Room or riser served.
 - d. Coil make and size.
 - e. Flowmeter type.
 - 2. Test Data (Indicated and Actual Values):
 - a. Airflow rate in cfm.
 - b. Entering-water temperature in deg F.
 - c. Leaving-water temperature in deg F.
 - d. Water pressure drop in feet of head or psig.
 - e. Entering-air temperature in deg F.
 - f. Leaving-air temperature in deg F.
- I. Instrument Calibration Reports:
 - 1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.10 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

John A. Bishop Elementary School Renovation Project Arlington Facilities Department 25 Columbia Road, Arlington, MA 02474 Audrey O'Hagan Architects Project No. 228.00 May 25, 2023

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Indoor, exposed supply and outdoor air.
- B. Related Sections:
 - 1. Section 230719 "HVAC Piping Insulation."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Fiberglass Wrap

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. ASJ Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

2.3 SEALANTS

- A. ASJ Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: White.

2.4 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
 - 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.

2.5 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 11.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.6 SECUREMENTS

- A. Insulation Pins and Hangers:
 - Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - b. Spindle: Aluminum, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.

- c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
- 2. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
 - b. Spindle: Nylon, 0.106-inch-diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
 - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
- 3. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - b. Spindle: Aluminum, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
 - c. Adhesive-backed base with a peel-off protective cover.
- 4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
- 5. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.
- C. Wire: 0.062-inch soft-annealed, galvanized steel.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 FINISHES

- A. Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below:
 - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Color: White

3.4 FIELD QUALITY CONTROL

A. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.5 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, exposed supply and outdoor air.
- B. Items Not Insulated:
 - 1. Fibrous-glass ducts.
 - 2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
 - 3. Factory-insulated flexible ducts.
 - 4. Factory-insulated plenums and casings.
 - 5. Flexible connectors.
 - 6. Vibration-control devices.
 - 7. Factory-insulated access panels and doors.

3.6 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, Supply-Air Duct and Plenum Insulation: Fiberglass blanket, 2 inches thick and 1.5-lb/cu. ft. nominal density.
- B. Concealed, Return-Air Duct and Plenum Insulation: Fiberglass blanket, 2 inches thick and 1.5-lb/cu. ft. nominal density.

END OF SECTION 230713

SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following HVAC piping systems:
 - 1. Heating hot-water piping, indoors.
- B. Related Sections:
 - 1. Section 230713 "Duct Insulation."
 - Section 230716 "HVAC Equipment Insulation."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C871.
- C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C795.

- D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- E. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Block Insulation: ASTM C552, Type I.
 - 2. Special-Shaped Insulation: ASTM C552, Type III.
 - 3. Board Insulation: ASTM C552, Type IV.
 - 4. Preformed Pipe Insulation without Jacket: Comply with ASTM C552, Type II, Class 1.
 - 5. Preformed Pipe Insulation with Factory-Applied ASJ-SSL: Comply with ASTM C552, Type II, Class 2.
 - 6. Factory fabricate shapes according to ASTM C450 and ASTM C585.

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C449.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.
- C. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

2.4 SEALANTS

- A. Joint Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Permanently flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 100 to plus 300 deg F.
 - 4. Color: White or gray.
- B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: White.

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.

2.6 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 - 1. Adhesive: As recommended by jacket material manufacturer.
 - 2. Color: White.
 - 3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- C. PVDC Jacket for Indoor Applications: 4-mil-thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E96/E96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E84.

2.7 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 11.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.
 - 1. Width: 3 inches.
 - 2. Film Thickness: 4 mils.
 - 3. Adhesive Thickness: 1.5 mils.
 - 4. Elongation at Break: 145 percent.
 - 5. Tensile Strength: 55 lbf/inch in width.

2.8 SECUREMENTS

- A. Aluminum Bands: ASTM B209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:

- 1. Draw jacket tight and smooth.
- 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
- 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at [2 inches] [4 inches] o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
- 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
- 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Manholes.
 - 5. Handholes.
 - 6. Cleanouts.

3.3 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.

- 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
- 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
- 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
- 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
- 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
- 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
- 8. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
 - Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 - 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 - 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 - 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe

- insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
- 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

- 1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
- 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
- 3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
- 4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

- 1. Install preformed pipe insulation to outer diameter of pipe flange.
- 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
- 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
- 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

- 1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
- 2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

- 1. Install preformed sections of cellular-glass insulation to valve body.
- 2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
- 3. Install insulation to flanges as specified for flange insulation application.

3.6 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

- 1. Draw jacket material smooth and tight.
- 2. Install lap or joint strips with same material as jacket.
- 3. Secure jacket to insulation with manufacturer's recommended adhesive.

- 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
- 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
 - Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.
- D. Where PVDC jackets are indicated, install as follows:
 - 1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
 - Wrap factory-presized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
 - 3. Continuous jacket can be spiral-wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
 - 4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches or less. The 33-1/2-inch-circumference limit allows for 2-inch-overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
 - 5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

END OF SECTION 230719

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes pipe and fitting materials and joining methods for the following:
 - 1. Steel pipe and fittings.
 - 2. Plastic pipe and fittings.
 - 3. Joining materials.
 - 4. Transition fittings.
 - 5. Dielectric fittings.
 - 6. Bypass chemical feeder.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Pipe.
 - 2. Fittings.
 - 3. Joining materials.
 - Bypass chemical feeder.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
 - 1. Hot-Water Heating Piping: 100 psig at 200 deg F.
 - 2. Chilled-Water Piping: 150 psig at 73 deg F.
 - 3. Condenser-Water Piping: 150 psig at 73 deg F.
 - 4. Makeup-Water Piping: 150 psig at 150 deg F.
 - 5. Condensate-Drain Piping: 180 deg F.
 - 6. Blowdown-Drain Piping: 200 deg F.

- 7. Air-Vent Piping: 180 deg F.
- 8. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.2 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.
- B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.
- C. DWV Copper Tubing: ASTM B 306, Type DWV.
- D. Wrought-Copper Unions: ASME B16.22.

2.3 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.
- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in "Piping Applications" Article.
- C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in "Piping Applications" Article.
- D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.
- E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in "Piping Applications" Article.
- F. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - 1. Material Group: 1.1.
 - 2. End Connections: Butt welding.
 - 3. Facings: Raised face.
- G. Grooved Mechanical-Joint Fittings and Couplings:
 - Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106/A 106M, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
 - 2. Couplings: Ductile- or malleable-iron housing and EPDM or nitrile gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
- H. Plain-End Mechanical-Joint Couplings:

- 1. Housing: ASTM A-536 Grade 65-45-12 segmented ductile iron or type 304 stainless steel.
- 2. Gasket: EPDM.
- 3. Sealing Mechanism: Double-lip sealing system or carbon steel case-hardened jaws.
- 4. Bolts, hex nuts, washers, or lock bars based on manufacturer's design.
- 5. Minimum Pressure Rating: Equal to that of the joined pipes.

2.4 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.
- E. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.5 TRANSITION FITTINGS

- A. Plastic-to-Metal Transition Fittings:
 - 1. One-piece fitting with one threaded brass or copper insert and one solvent-cement-joint end of material and wall thickness to match plastic pipe material.
- B. Plastic-to-Metal Transition Unions:
 - 1. Brass or copper end, solvent-cement-joint end of material and wall thickness to match plastic pipe material, rubber gasket, and threaded union.

2.6 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 - 1. Description:
 - a. Standard: ASSE 1079.

- b. Pressure Rating: 125 psig minimum at 180 deg F.
- c. End Connections: Solder-joint copper alloy and threaded ferrous.

2.7 BYPASS CHEMICAL FEEDER

- A. Description: Welded steel construction; 125-psig working pressure; 5-gal. capacity; with fill funnel and inlet, outlet, and drain valves.
 - 1. Chemicals: Specially formulated, based on analysis of makeup water, to prevent accumulation of scale and corrosion in piping and connected equipment.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be the following:
 - 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
- B. Hot-water heating piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:
 - 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and brazed joints.
 - 2. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
 - 3. Schedule 40 steel pipe, plain-end mechanical-coupled joints.
- C. Hot-Water Heating Piping Installed Belowground and within Slabs: Type K, annealed-temper copper tubing, wrought-copper fittings, and brazed joints. Use the fewest possible joints.
- D. Chilled-water piping, aboveground, NPS 2 and smaller, shall be the following:
 - 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
- E. Chilled-water piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:
 - 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and brazed joints.
 - 2. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
 - 3. Schedule 40 steel pipe, plain-end mechanical-coupled joints.
- F. Chilled-Water Piping Installed Belowground and within Slabs: Type K, annealed-temper copper tubing, wrought-copper fittings, and brazed joints. Use the fewest possible joints.
- G. Condenser-water piping, aboveground, NPS 2 and smaller, shall be the following:
 - 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
- H. Condenser-water piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:
 - 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and brazed joints.

- 2. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
- 3. Schedule 40 steel pipe, plain-end mechanical-coupled joints.
- I. Condenser-Water Piping Installed Belowground and within Slabs: Type K, annealed-temper copper tubing, wrought-copper fittings, and brazed joints. Use the fewest possible joints.
- J. Makeup-water piping installed aboveground shall be the following:
 - 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and brazed joints.
- K. Makeup-Water Piping Installed Belowground and within Slabs: Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints.
- L. Condensate-Drain Piping: Type M, drawn-temper copper tubing, wrought-copper fittings, and soldered joints or Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.
- M. Condensate-Drain Piping: Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.
- N. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.
- O. Air-Vent Piping:
 - 1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.
 - 2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.
- P. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.

3.2 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.

- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- O. Install branch connections to mains usingtee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
- P. Install valves according to the following:
 - 1. Section 230523.12 "Ball Valves for HVAC Piping."
 - 2. Section 230523.13 "Butterfly Valves for HVAC Piping."
 - Section 230523.14 "Check Valves for HVAC Piping."
 - 4. Section 230523.15 "Gate Valves for HVAC Piping."
- Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.
- S. Install shutoff valve immediately upstream of each dielectric fitting.
- T. Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.
- U. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.
- V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.
- D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.4 HANGERS AND SUPPORTS

- A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices.
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
 - 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 - 4. Spring hangers to support vertical runs.
 - 5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
 - 6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.
- C. Install hangers for copper tubing and steel piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Support vertical runs of copper tubing and steel piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- E. Install hangers for plastic piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced code, and authorities having jurisdiction requirements, whichever are most stringent.
- F. Support horizontal piping within 12 inches of each fitting and coupling

3.5 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using leadfree solder alloy complying with ASTM B 32.

- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.
- E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- G. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 3. PVC Pressure Piping: Join ASTM D 1785 schedule number, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule number PVC pipe and socket fittings according to ASTM D 2855.
 - 4. PVC Nonpressure Piping: Join according to ASTM D 2855.
- H. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.
- I. Plain-End Mechanical-Coupled Joints: Prepare, assemble, and test joints in accordance with manufacturer's written installation instructions.
- J. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.

3.6 TERMINAL EQUIPMENT CONNECTIONS

- A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.
- B. Install control valves in accessible locations close to connected equipment.
- C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.
- D. Install ports for pressure gages and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230519 "Meters and Gages for HVAC Piping."

3.7 CHEMICAL TREATMENT

- A. Fill system with fresh water and add liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products from piping. Circulate solution for a minimum of 24 hours, drain, clean strainer screens, and refill with fresh water.
- B. Add initial chemical treatment and maintain water quality in ranges noted above for the first year of operation.
- C. Fill systems that have antifreeze or glycol solutions with the following concentrations:
 - 1. Hot-Water Heating Piping: Minimum percentage of propylene glycol as indicated on drawings.
 - 2. Chilled-Water Piping: Minimum percentage of propylene glycol as indicated on drawings.

3.8 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
 - 1. Leave joints, including welds, uninsulated and exposed for examination during test.
 - 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 - 3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
 - 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 - 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:
 - Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used
 - 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
 - 3. Isolate expansion tanks and determine that hydronic system is full of water.
 - 4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
 - 5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
 - 6. Prepare written report of testing.
- C. Perform the following before operating the system:
 - 1. Open manual valves fully.
 - 2. Inspect pumps for proper rotation.

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- 3. Set makeup pressure-reducing valves for required system pressure.
- 4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
- 5. Set temperature controls so all coils are calling for full flow.
- 6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
- 7. Verify lubrication of motors and bearings.

END OF SECTION 232113

SECTION 232116 - HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Strainers.
- 2. Connectors.

B. Related Requirements:

1. Section 230523.12 "Ball Valves for HVAC Piping" for specification and installation requirements for ball valves common to most piping systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product:

- 1. Include construction details and material descriptions for hydronic piping specialties.
- 2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

PART 2 - PRODUCTS

2.1 STRAINERS

A. Y-Pattern Strainers:

- 1. Body: ASTM A126, Class B, cast iron with bolted cover and bottom drain connection.
- 2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
- 3. Strainer Screen: Stainless-steel, 40-mesh strainer, or perforated stainless-steel basket.
- 4. CWP Rating: 125 psig.

2.2 CONNECTORS

A. Stainless-Steel Bellow. Flexible Connectors:

- 1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
- 2. End Connections: Threaded or flanged to match equipment connected.
- 3. Performance: Capable of 3/4-inch misalignment.
- 4. CWP Rating: 150 psig.
- 5. Maximum Operating Temperature: 250 deg F.

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PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

- A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.
- B. Install calibrated-orifice, balancing valves at each branch connection to return main.

END OF SECTION 232116

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Single-wall rectangular ducts and fittings.
- 2. Single-wall round ducts and fittings.
- 3. Sheet metal materials.
- 4. Sealants and gaskets.
- 5. Hangers and supports.

B. Related Sections:

- 1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
- 2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following products:
 - 1. Liners and adhesives.
 - 2. Sealants and gaskets.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" and with performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards Metal and Flexible".

- C. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.
- D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 "Systems and Equipment," and Section 7 "Construction and System Startup."
- E. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 "HVAC System Construction and Insulation."
- F. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
 - 1. Construct ducts of galvanized sheet steel unless otherwise indicated.
- B. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards Metal and Flexible."
 - 1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.
- C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards Metal and Flexible."

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Construct ducts of galvanized sheet steel unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support

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intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards Metal and Flexible."
- D. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards Metal and Flexible."

2.4 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A653/A653M.
 - 1. Galvanized Coating Designation: G90.
- C. Reinforcement Shapes and Plates: ASTM A36/A36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- D. Tie Rods: Galvanized steel, 1/4-inch-minimum diameter for lengths 36 inches or less; 3/8-inch-minimum diameter for lengths longer than 36 inches.

2.5 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
 - 1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 - 2. Tape Width: 4 inches.
 - 3. Sealant: Modified styrene acrylic.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 - 7. Service: Indoor and outdoor.
 - 8. Service Temperature: Minus 40 to plus 200 deg F.

C. Water-Based Joint and Seam Sealant:

- 1. Application Method: Brush on.
- 2. Solids Content: Minimum 65 percent.
- 3. Shore A Hardness: Minimum 20.
- 4. Water resistant.
- 5. Mold and mildew resistant.
- 6. VOC: Maximum 75 g/L (less water).
- 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
- 8. Service: Indoor or outdoor.
- 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- 10. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
- 11. Service: Indoor or outdoor.
- 12. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- D. Flanged Joint Sealant: Comply with ASTM C920.
 - 1. General: Single-component, acid-curing, silicone, elastomeric.
 - 2. Type: S.
 - 3. Grade: NS.
 - Class: 25.
 - 5. Use: O.
- E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- F. Round Duct Joint O-Ring Seals:
 - 1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for10-inch wg static-pressure class, positive or negative.
 - 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 - 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.
- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A603.
- D. Steel Cable End Connections: Galvanized-steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- F. Trapeze and Riser Supports:

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1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.
- B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" unless otherwise indicated.
- C. Install ducts in maximum practical lengths with fewest possible joints.
- D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- J. Install heating coils, cooling coils, air filters, dampers, and all other duct-mounted accessories in air ducts where indicated on Drawings.
- K. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."
- L. Elbows: Use long-radius elbows wherever they fit.
 - 1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.
 - 2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.

M. Branch Connections: Use lateral or conical branch connections.

3.2 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article in accordance with SMACNA's "HVAC Duct Construction Standards Metal and Flexible."
- B. Seal ducts at a minimum to the following seal classes in accordance with SMACNA's "HVAC Duct Construction Standards Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible."
 - 2. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
 - 3. Conditioned Space, Return-Air Ducts: Seal Class C.

3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 - Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
 - 2. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 - 3. Testing of each duct section is to be performed with access doors, coils, filters, dampers, and other duct-mounted devices in place as designed. No devices are to be removed or blanked off so as to reduce or prevent additional leakage.
 - 4. Test for leaks before applying external insulation.
 - 5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
 - 6. Give seven days' advance notice for testing.
- C. Duct System Cleanliness Tests:
 - 1. Visually inspect duct system to ensure that no visible contaminants are present.
 - 2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness in accordance with "Description of Method 3 NADCA Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
 - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sg. cm.
- D. Duct system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.6 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Use duct cleaning methodology as indicated in NADCA ACR.
- C. Use service openings for entry and inspection.
 - 1. Provide openings with access panels appropriate for duct static-pressure and leakage class at dampers, coils, and any other locations where required for inspection and cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
 - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- D. Particulate Collection and Odor Control:
 - 1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.

- 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- E. Clean the following components by removing surface contaminants and deposits:
 - 1. Air outlets and inlets (registers, grilles, and diffusers).
 - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 - 4. Coils and related components.
 - 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
 - 6. Supply-air ducts, dampers, actuators, and turning vanes.
 - 7. Dedicated exhaust and ventilation components and makeup air systems.

F. Mechanical Cleaning Methodology:

- 1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
- 2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
- 3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
- 4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
- 5. Clean coils and coil drain pans in accordance with NADCA ACR. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
- 6. Provide drainage and cleanup for wash-down procedures.
- 7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents in accordance with manufacturer's written instructions after removal of surface deposits and debris.

3.7 STARTUP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

END OF SECTION 233113

METAL DUCTS 233113 - 8

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Manual volume dampers.
- 2. Flange connectors.
- 3. Duct accessory hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A653/A653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - Standard leakage rating.

- 2. Suitable for horizontal or vertical applications.
- 3. Frames:
 - a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.

4. Blades:

- a. Multiple or single blade.
- b. Parallel- or opposed-blade design.
- c. Stiffen damper blades for stability.
- d. Galvanized-steel, 0.064 inch thick.
- 5. Blade Axles: Galvanized steel.
- 6. Bearings:
 - a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
- 7. Tie Bars and Brackets: Galvanized steel.

B. Jackshaft:

- 1. Size: 0.5-inch diameter.
- 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
- 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:

- 1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
- 2. Include center hole to suit damper operating-rod size.
- 3. Include elevated platform for insulated duct mounting.

2.4 FLANGE CONNECTORS

- A. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- B. Material: Galvanized steel.
- C. Gage and Shape: Match connecting ductwork.

2.5 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

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B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
- F. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- G. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- H. Connect flexible ducts to metal ducts with draw bands.
- I. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.

END OF SECTION 233300

SECTION 233346 - FLEXIBLE DUCTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Insulated flexible ducts.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- C. Comply with the Air Diffusion Council's "ADC Flexible Air Duct Test Code FD 72-R1."
- D. Comply with ASTM E96/E96M, "Test Methods for Water Vapor Transmission of Materials."

2.2 INSULATED FLEXIBLE DUCTS

- A. Insulated, Flexible Duct: UL 181, Class 1, two-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 10 to plus 160 deg F.
 - 4. Insulation R-Value: R8.

2.3 FLEXIBLE DUCT CONNECTORS

A. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

FLEXIBLE DUCTS 233346 - 1

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install flexible ducts according to applicable details in SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install in indoor applications only. Flexible ductwork should not be exposed to UV lighting.
- C. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- D. Connect flexible ducts to metal ducts with draw bands.
- E. Install duct test holes where required for testing and balancing purposes.

F. Installation:

- 1. Install ducts fully extended.
- Do not bend ducts across sharp corners.
- 3. Bends of flexible ducting shall not exceed a minimum of one duct diameter.
- 4. Avoid contact with metal fixtures, water lines, pipes, or conduits.
- 5. Install flexible ducts in a direct line, without sags, twists, or turns.

G. Supporting Flexible Ducts:

- Suspend flexible ducts with bands 1-1/2 inches wide or wider and spaced a maximum of 48 inches apart. Maximum centerline sag between supports shall not exceed 1/2 inch per 12 inches.
- 2. Install extra supports at bends placed approximately one duct diameter from center line of the bend.
- 3. Ducts may rest on ceiling joists or truss supports. Spacing between supports shall not exceed the maximum spacing per manufacturer's written installation instructions.
- 4. Vertically installed ducts shall be stabilized by support straps at a maximum of 72 inches o.c.

END OF SECTION 233346

FLEXIBLE DUCTS 233346 - 2

SECTION 233713.13 - AIR DIFFUSERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular and square ceiling diffusers.

B. Related Requirements:

- 1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers.
- 2. Section 233713.23 "Air Registers and Grilles" for adjustable-bar register and grilles, fixed-face registers and grilles, and linear bar grilles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 RECTANGULAR AND SQUARE CEILING DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hart & Cooley, LLC.
 - 2. METALAIRE, Inc.
 - 3. Nailor Industries Inc.
 - 4. Price Industries Limited.
 - 5. Titus.
 - 6. Tuttle & Bailey
- B. Devices shall be specifically designed for variable-air-volume flows.
- C. Material: Match basis of design as scheduled on drawings.
- D. Finish: Match basis of design as scheduled on drawings.
- E. Face Size: Match basis of design as scheduled on drawings.
- F. Face Style: Match basis of design as scheduled on drawings.
- G. Mounting: Match basis of design as scheduled on drawings.
- H. Pattern: Match basis of design as scheduled on drawings.

AIR DIFFUSERS 233713.13 - 1

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- I. Dampers: Radial opposed blade.
- J. Accessories: Match items as scheduled on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install diffusers level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.13

AIR DIFFUSERS 233713.13 - 2

SECTION 233713.23 - REGISTERS AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fixed face grilles.
- B. Related Requirements:
 - 1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to registers and grilles.
 - 2. Section 233713.13 "Air Diffusers" for various types of air diffusers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 GRILLES

- A. Fixed Face Grille "RG":
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hart & Cooley, LLC.
 - 2. METALAIRE, Inc.
 - 3. Nailor Industries Inc.
 - 4. Price Industries Limited.
 - 5. Titus.
 - 6. Tuttle & Bailey
 - 7. Material: Aluminum.
 - 8. Finish: Baked enamel, white.
 - 9. Face Arrangement: Perforated core.
 - 10. Core Construction: Integral.
 - 11. Frame: 1-1/4 inches wide.
 - 12. Mounting: Lay in.
 - 13. Accessory: Filter.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install registers and grilles level and plumb.
- B. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install registers and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

A. After installation, adjust registers and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.23

SECTION 238216.11 - HYDRONIC AIR COILS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes hydronic heating and cooling air coils.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. ASHRAE Compliance: Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

2.2 COILS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Nailor
 - 2. Aerofin.
 - 3. Greenheck Fan Corporation.
 - 4. Modine Manufacturing Company.
- B. Performance Ratings: Tested and rated according to AHRI 410 and ASHRAE 33.
- C. Minimum Working-Pressure/Temperature Ratings: 200 psig, 325 deg F.
- D. Source Quality Control: Factory tested to 300 psig.
- E. Tubes: ASTM B743 copper, minimum 0.016" thick.
- F. Fins: Aluminum, minimum 0.0045 inch thick.
- G. Frames: Galvanized-steel channel frame, minimum 0.052 inch thick for flanged mounting.

HYDRONIC AIR COILS 238216.11 - 1

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install coils level and plumb.
- B. Install coils in metal ducts and casings constructed according to SMACNA's "HVAC Duct Construction Standards, Metal and Flexible."
- C. Install galvanized-steel drain pan under each cooling coil.
 - 1. Construct drain pans with connection for drain; insulated and complying with ASHRAE 62.1.
 - 2. Construct drain pans to extend beyond coil length and width and to connect to condensate trap and drainage.
 - 3. Extend drain pan upstream and downstream from coil face.
 - 4. Extend drain pan under coil headers and exposed supply piping.
- D. Install moisture eliminators for cooling coils. Extend drain pan under moisture eliminator.
- E. Straighten bent fins on air coils.
- F. Clean coils using materials and methods recommended in writing by manufacturers, and clean inside of casings and enclosures to remove dust and debris.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to coils to allow service and maintenance.
- C. Connect water piping with unions and shutoff valves to allow coils to be disconnected without draining piping. Control valves are specified in Section 230923.11 "Control Valves," and other piping specialties are specified in Section 232116 "Hydronic Piping Specialties."

END OF SECTION 238216.11

HYDRONIC AIR COILS 238216.11 - 2

SECTION 260500 - GENERAL CONDITIONS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.
- B. Reference Drawings: The Work of project is shown on the following Contract Drawings: E-0.0, E-1.0, E-1.1, FA-0.0, FA-0.1.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
- B. The work under the Contract consists of:
 - 1. Provide new connections to each piece of equipment provided by others as depicted on the drawings.
 - 2. Reuse and extend existing branch circuitry as needed.
 - 3. Provide new lighting controls and receptacles controls.
 - 4. Provide new light fixtures (luminaires)
 - 5. Provide new receptacles.
 - 6. Provide all demolition associated with the above work and as depicted on the drawings.
 - 7. Provide all grounding and bonding associated with this work.
 - 8. Extend fire alarm loops and provide new fire alarm devices.
 - 9. Record drawings and similar requirements.
- C. Alternates: Not Applicable.
- D. The Electrical Contractor shall be responsible for filing all documents, payment of all fees, permits, and securing of all inspections and approvals necessary for the electrical work, the owner shall pay for all permits and fees.

1.3 SUBMITTALS

- A. Comply with requirements specified in DIVISION 01 and provide electronic files in Adobe Acrobat format to the engineer for their approval.
- B. Material and equipment requiring Shop Drawing Submittals shall include but not be limited to:
 - 1. Wiring.
 - 2. Conduit.
 - 3. Boxes and conduit fittings.
 - 4. Nameplates
 - 5. Luminaires
 - 6. Lighting/Plug Controllers
 - 7. Lighting Controls

1.4 REFERENCES

- A. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any electrical item in the drawings or specifications for electrical work carries with it the instruction to furnish, install and connect the item as part of the electrical work, regardless of whether or not this instruction is explicitly stated.
- B. It shall be understood that the specifications and drawings for electrical work are complimentary and are to be taken together for a complete interpretation of the electrical work except that indications on the drawings, which refer to an individual element of work, take precedence over the specifications where they conflict with same.

1.5 REGULATORY REQUIREMENTS

- A. Comply with all applicable federal and state laws, and all local codes, by-laws and ordinances.
- B. Where provisions of the Contract Documents conflict with any codes, rules or regulations, the latter shall govern. Where the contract requirements are in excess of applicable codes, rules or regulations, the contract provisions shall govern unless the Engineer rules otherwise.
- C. Request inspections from authorities having jurisdiction, obtain all permits and pay for all fees and inspection certificates as applicable and/or required. All permits and certificates shall be turned over to the Owner's representative at the completion of the work. Copies of permits shall be given to the resident engineer prior to the start of work.
- D. Unless otherwise specified or indicated, materials and workmanship and equipment performance shall conform with the latest edition of the following standards, codes, specifications, requirements and regulations:
 - 1. State Building Code
 - 2. State Electrical Code
 - 3. National Fire Protection Association (NFPA)
 - 4. Local Town Regulations and By-laws
 - 5. Underwriter's Laboratories, Inc. (UL)
 - 6. National Electrical Manufacturer's Association (NEMA)
 - 7. American National Standards Institute (ANSI)
- E. All electrical work shall meet or exceed any other state and local codes and/or authorities having jurisdiction including all other standards indicated herein.

1.6 COORDINATION

- A. Electrical Drawings are diagrammatic. They indicate general arrangements of electrical systems. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with other trades and existing site conditions, and to meet the requirements.
- B. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the work.
- C. Furnish to other trades advance information on locations and sizes of all frames, boxes, sleeves and openings needed for their work, and also furnish information and

shop drawings necessary to permit trades affected by the work to install same properly and without delay.

- D. In all spaces, prior to installation of visible material and equipment, including access panels, review electrical drawings for exact locations and where not definitely indicated, request information from Engineer. Where the electrical work shall interfere with the work of other trades, assist in working out the space conditions to make satisfactory adjustments before installation. Without extra cost to Owner, make reasonable modifications to the work as required by normal structural interferences. Pay the Electrical Contractor for additional openings, or relocating and/or enlarging existing openings through concrete floors, walls, beams and roof required for any work which was not properly coordinated. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.
- E. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Engineer for review and approval.
- F. Protect all materials and work of other trades from damage which may be caused by the electrical work, and repair all damages without extra cost to Owner.

1.7 INSTALLATION REQUIREMENTS

A. The arrangement of all electrical work shown on the drawings is diagrammatic only and indicates the minimum requirements of the work. Conditions at the building including actual measurements shall determine the details of the installation. All work shall be laid out and installed so as to require the least amount of cutting and patching.

1.8 TYPICAL DETAILS

A. Typical details where shown on the drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the drawings, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate method proposed for use by the Contractor shall have the prior approval of the Engineer.

1.9 SLEEVES, INSERTS

A. Furnish and install all sleeves, inserts, anchor bolts and similar items to be set into masonry or concrete, as required for mechanical and electrical work. Internal diameter of sleeve shall be 2" larger than the outside diameter of the pipe or insulation covered line passing through it.

1.10 CORING, DRILLING

A. Core, cut and/or drill all holes in walls and floors required for the installation of sleeves and supports for the electrical work.

1.11 ACCESSIBILITY

- A. Install all work such that parts requiring periodic inspection, operation, maintenance and repair are readily accessible.
- B. Furnish all access panels appropriate to particular conditions, to be installed by trades having responsibility for the construction of actual walls, floors or ceilings at required locations.

1.12 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of the mechanical and electrical equipment at the site.

1.13 PORTABLE AND DETACHABLE PARTS

A. Contractors shall retain in their possession all portable and/or detachable parts and portions of materials, devices, equipment etc. necessary for the proper operation and maintenance of the mechanical and electrical systems until final completion of the work, at which time they shall be handed over to Owner's representative.

1.14 RECORD DRAWINGS, PROJECT CLOSEOUT

- A. Comply with requirements specified in DIVISION 01.
- B. This trade shall submit the record set for approval by the engineer.
- C. This trade shall submit the record set for approval by the fire and building departments in a form acceptable to the departments, when required by the jurisdiction.
- D. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

1.15 GUARANTEE/WARRANTY

- A. Guarantee Work of this Section in writing for one year following the date of beneficial occupancy by the owner or as required by other sections. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to Engineer's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.
- B. In addition to guarantee requirements of DIVISION 01 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in the Owner's name.
 - Upon receipt of notice from Owner's representative of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this Contractor without any reimbursement.
 - 2. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Engineer.
 - 3. Provide 24 hour service beginning on the date the project is accepted by Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to Owner. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to Engineer and Owner's representative's approval. Submit name and a phone number that will be answered on a 24-hour basis each day of the week, for the duration of the service.
 - 4. Submit copies of equipment and material warranties to Engineer before final payment.
 - 5. At end of guarantee period, transfer manufacturers' equipment and material warranties still in force to the Owner.

- 6. This Paragraph shall not be interpreted to limit Owner's rights under applicable codes and laws and under this Contract.
- 7. Other sections of this Specification may specify warranty requirements that exceed those of this Paragraph. Those paragraphs will govern.
- 8. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work by Owner's representative, and shall not initiate the guarantee period.
- 9. Non-durable items, such as electric lamps, shall be replaced up to the date of acceptance, such that they shall have had no more than 100 hours use prior to this date.
- 10. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to Owner's representative's satisfaction, advise Engineer in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Engineer will direct course of action.

1.16 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

- A. Refer to DIVISION 01 for submittal procedures pertaining to operating and maintenance manuals.
- B. Each copy of the approved operating and maintenance manual shall contain copies of approved shop drawings, equipment literature, cuts, bulletins, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed. Each manual shall have the following minimum contents:

TABLE OF CONTENTS

2. Introduction

- a. Explanation of manual and its purpose and use.
- b. Description of the electrical systems.
- c. Safety precautions necessary for equipment.
- d. Illustrations, schematics and diagrams.
- e. Installation drawing.

3. Maintenance

- a. Maintenance and lubricating instructions.
- b. Replacement charts.
- c. Trouble shooting charts for equipment components.
- d. Testing instructions for each typical component.

- e. Two typed sets of instructions for ordering spare parts. Each set shall include name, price, telephone number and address of where they may be obtained.
- 4. Manufacturer's Literature
 - a. The equipment for which shop drawings have been submitted and approved.

1.17 QUALITY ASSURANCE

- A. The requirements of the State Building Code and local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.
- B. All work shall comply with the latest editions of the codes as referenced herein.
- C. Follow manufacturer's directions for articles furnished, in addition to directions shown on drawings or specified herein.
- D. Protect all work, materials, and equipment from damage during process of work.

 Replace all damaged or defective work, materials and equipment without additional cost to Owner.
- E. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.
- F. Equipment and materials shall:
 - Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed or labeled.
 - 2. Be without blemish or defect.
 - 3. Not be used for temporary light and power purposes.
 - 4. Be in accordance with the latest applicable NEMA standards.
 - 5. Be products which will meet with the acceptance of all authorities having jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be so examined, tested and certified.
- G. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.
- H. For items which are to be installed but not purchased as part of the electrical work, the electrical work shall include:
 - 1. The coordination of their delivery.
 - 2. Their unloading from delivery trucks driven into any point on the property line at grade level.

- 3. Their safe handling and field storage up to the time of permanent placement in the project.
- 4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement if necessary shall be coordinated with Contractor who originally purchased the item.
- 5. Their field make-up and internal wiring as may be necessary for their proper operation.
- 6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
- 7. Their connection to building wiring including the purchase and installation of all termination junction boxes necessary to adapt and connect them to this wiring. Included also shall be the purchase and installation of any substitute lugs or other wiring terminations as may be necessary to adapt their terminals to the building wiring as called for and to the connection methods set forth in these specifications.
- I. Items which are to be installed but not purchased as part of the electric work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The electric work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

1.18 DELIVERY, STORAGE AND HANDLING

A. All materials for the work of this section shall be delivered, stored and handled so as to preclude damage of any nature. Manufactured materials shall be delivered and stored in their original containers, plainly marked with the products' and manufacturer's name. Materials in broken containers or in packages showing watermarks or other evidence of damage, shall not be used and shall be removed from the site.

1.19 PHASING, DEMOLITION AND MAINTAINING EXISTING SERVICES

- A. During the execution of the work, the required disconnection, relocation, etc., of existing equipment and systems in the existing building areas where new work is to be installed or new connections are scheduled to be made, shall be performed by the Electrical Contractor, as required by job conditions and as determined by the Engineer in the field, to facilitate the installation of the new system, while demolition, relocation work or new tie ins will be performed.
- B. Outages required for construction purposes shall be scheduled for the shortest practical periods of time, in coordination with the Owner's designated representative, for specified, mutually agreeable periods of time, after each of which the interruption shall cease and the service shall be restored. This procedure shall be repeated to suit the Owner's working schedule, as many times as required until all work is completed. Any outages of service shall be approved by Owner's representative, prior to commencing the work. No outages or shutdowns of service shall occur without the written authorization of the Owner's representative prior to commencing the work. Give notice of any scheduled shutdowns, a minimum of weeks in advance. Owner shall make their best efforts to meet this request without adversely affecting the electric service to the existing building.

Audrey O'Hagan Architects Project No. 228.00 May 25, 2023

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Product specifications are written in such a manner so as to specify what materials may be used in a particular location or application and therefore do not indicate what is not acceptable or suitable for a particular location or application. As an example: non-metallic sheathed cable is not specified; therefore, it is not acceptable.
- B. For purpose of establishing a standard of quality and not for purpose of limiting competition, the basis of this Specification is upon specified models and types of equipment and materials, as manufactured by specified manufacturers.
- C. In all cases, standard cataloged materials and systems have been selected. Materials such as lighting fixtures specially manufactured for this particular project and not part of a manufacturer's standard product line will not be acceptable. In the case of systems, the system components shall be from a single source regularly engaged in supplying such systems. A proposed system made up of a collection of various manufacturers products will be unacceptable.
- D. Where Specifications list manufacturer's names and/or "as approved" or "Equal approved by Engineer", other manufacturers equipment will be considered if equipment meets Specification requirements and has all features of the specified items as are considered essential by Engineer.
- E. All materials shall be new and shall be UL listed.

2.2 SERVICE CHARACTERISTICS

- A. Building Voltage: 120/208Y, three phase.
- B. All equipment and wiring shall be suitable for the applied voltage.

PART 3 - EXECUTION

NOT USED

END OF SECTION 26050

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Copper building wire rated 600 V or less.
- 2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alpha Wire Company.
 - 2. American Bare Conductor.
 - 3. Belden Inc.
 - 4. Cerro Wire LLC.
 - 5. Encore Wire Corporation.
 - 6. General Cable; Prysmian Group North America.
 - 7. Okonite Company (The).
 - 8. Service Wire Co.
 - 9. Southwire Company.
 - 10. WESCO.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

- 2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with ASTM B3 for bare annealed copper.
- E. Conductor Insulation:
 - 1. Type THHN and Type THWN-2: Comply with UL 83.

2.2 METAL-CLAD CABLE, TYPE MC

- A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems; Atkore International.
 - 2. Alpha Wire Company.
 - 3. American Bare Conductor.
 - 4. Belden Inc.
 - 5. Encore Wire Corporation.
 - 6. General Cable; Prysmian Group North America.
 - 7. Okonite Company (The).
 - 8. Service Wire Co.
 - 9. Southwire Company.
 - 10. WESCO.

C. Standards:

- 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- 2. Comply with UL 1569.
- 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Circuits:

- 1. Single circuit.
- 2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.
- E. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- F. Ground Conductor: Bare or Insulated.
- G. Conductor Insulation:
 - 1. Type TFN/THHN/THWN-2: Comply with UL 83.
- H. Jacket: PVC applied over armor.

2.3 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. All circuitry:
 - 1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders or Branch Circuits: Type THHN/THWN-2, single conductors in raceway.
- B. Feeders or Branch Circuits Concealed in Ceilings, Walls, Partitions, Crawlspaces, etc: Metalclad cable, Type MC.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 INSTALLATION OF FIRE-ALARM WIRE AND CABLE

- A. Comply with NFPA 72.
- B. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with fire-alarm system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

3.5 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torquetightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inch of slack.

3.6 IDENTIFICATION

A. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 15/8 inches wide and 1/16 inch thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

- B. High compression copper or copper alloy connectors.
- C. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- D. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors, except as otherwise indicated.
 - 3. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Flexible raceway runs.
 - 5. Armored and metal-clad cable runs.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

- 1. Hangers and supports for electrical equipment and systems.
- 2. Construction requirements for concrete bases.

1.2 SUBMITTALS

- A. Product Data: For steel slotted support systems.
 - 1. Equipment supports.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 2. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 3. Toggle Bolts: All-steel springhead type.
 - 4. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 6. To Light Steel: Sheet metal screws.
 - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

END OF SECTION 260529

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Type EMT-S raceways and elbows.
- 2. Type FMC-S and Type FMC-A raceways.
- 3. Fittings for conduit, tubing, and cable.
- 4. Threaded metal joint compound.
- 5. Surface metal raceways and fittings.
- 6. Metallic outlet boxes, device boxes, and covers.
- 7. Termination boxes.
- 8. Cover plates for device boxes.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

- 1. Wireways and auxiliary gutters.
- 2. Conduit.
- 3. Boxes.
- 4. Coverplates.

PART 2 - PRODUCTS

2.1 TYPE EMT-S RACEWAYS AND ELBOWS

- A. Steel Electrical Metal Tubing (EMT-S) and Elbows:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit; Atkore International.
 - b. Calconduit: Atkore International.
 - c. Emerson Electric Co.
 - d. Picoma; Zekelman Industries.
 - e. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
 - f. Topaz Lighting & Electric.
 - g. Western Tube; Zekelman Industries.
 - h. Wheatland Tube; Zekelman Industries.
 - 2. Applicable Standards:

- a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- b. General Characteristics:
 - 1) Reference Standards: UL 797 and UL Category Control Number FJMX.
 - 2) Material: Steel.
- c. Options:
 - 1) Minimum Trade Size: 3/4 inch.
 - 2) Colors: As indicated on Drawings.

2.2 TYPE FMC-S RACEWAYS

- A. Steel Flexible Metal Conduit (FMC-S):
 - 1. Applicable Standards:
 - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - b. General Characteristics:
 - 1) Reference Standard: UL 1 and UL Category Control Number DXUZ.
 - 2) Material: Steel.
 - c. Options:
 - 1) Minimum Trade Size 3/4 inch.
 - 2) Colors: As indicated on Drawings.

2.3 METALLIC OUTLET BOXES, DEVICE BOXES, AND COVERS

- A. Metallic Outlet Boxes:
 - 1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
 - 2. Applicable Standards:
 - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - b. General Characteristics:
 - 1) Reference Standards: UL 514A and UL Category Control Number QCIT.
- B. Metallic Conduit Bodies:

- 1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
- 2. Applicable Standards:
 - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - b. General Characteristics:
 - 1) Reference Standards: UL 514A and UL Category Control Number QCIT.

C. Metallic Device Boxes:

- 1. Description: Box with provisions for mounting wiring device directly to box.
- 2. Applicable Standards:
 - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - b. General Characteristics:
 - 1) Reference Standards: UL 514A and UL Category Control Number QCIT.
 - c. Options:
 - 1) Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb.

2.4 COVER PLATES FOR DEVICES BOXES

- A. Metallic Cover Plates for Device Boxes:
 - 1. Applicable Standards:
 - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - b. General Characteristics:
 - 1) Reference Standards: UL 514D and UL Category Control Numbers QCIT and QCMZ.
 - 2) Wallplate-Securing Screws: Metal with head color to match wallplate finish.

PART 3 - EXECUTION

3.1 INSTALLATION OF RACEWAYS

A. Installation Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for installation of raceways. Consult Architect for resolution of conflicting requirements.

- 2. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- 3. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- 4. Comply with NECA NEIS 101 for installation of steel raceways.
- 5. Install raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
- 6. Raceway Terminations at Locations Subject to Moisture or Vibration:
 - a. Provide insulating bushings to protect conductors, including conductors smaller than No. 4 AWG..

B. General Requirements for Installation of Raceways:

- 1. Complete raceway installation before starting conductor installation.
- 2. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft. above finished floor.
- 3. Install no more than equivalent of three 90-degree bends in conduit run. Support within 12 inch of changes in direction.
- 4. Make bends in raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
- 5. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- 6. Support conduit within 12 inch of enclosures to which attached.
- 7. Install raceway sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings in accordance with NFPA 70.
- 8. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of raceways at the following points:
 - a. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - b. Where an underground service raceway enters a building or structure.
 - c. Conduit extending from interior to exterior of building.
 - d. Conduit extending into pressurized duct and equipment.
 - e. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
 - f. Where otherwise required by NFPA 70.
- 9. Do not install raceways or electrical items on "explosion-relief" walls or rotating equipment.
- 10. Do not install conduits within 2 inch of the bottom side of a metal deck roof.
- 11. Keep raceways at least 6 inch away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

- 12. Cut conduit perpendicular to the length. For conduits 2 inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
- 13. Install pull wires in empty raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inch of slack at both ends of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

3.2 INSTALLATION OF BOXES AND ENCLOSURES

- A. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
- B. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- C. Locate boxes so that cover or plate will not span different building finishes.
- D. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
- E. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
- F. Set metal floor boxes level and flush with finished floor surface.
- G. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.
- H. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.

3.3 CLEANING

A. Boxes: Remove construction dust and debris from device boxes, outlet boxes, and floor-mounted enclosures before installing wallplates, covers, and hoods.

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Identification for raceways.
- 2. Identification of power and control cables.
- 3. Identification for conductors.
- 4. Warning labels and signs.
- 5. Instruction signs.
- 6. Equipment identification labels.
- 7. Miscellaneous identification products.

1.2 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 - PRODUCTS

2.1 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER ELECTRICAL SHOCK HAZARD EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING OSHA REGULATION AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."
 - 3. Arc Flash Warning Label.

Grounding Electrode: "WARNING - SHOCK HAZARD EXISTS IF GROUNDING ELECTRODE CONDUCTOR OR BONDING JUMPER CONNECTION IN THIS EQUIPMENT IS REMOVED WHILE ALTERNATE SOURCE IS ENERGIZED."

2.2 INSTRUCTION SIGNS

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.3 EQUIPMENT IDENTIFICATION LABELS

A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inc.

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power.
 - 2. Normal Power.
 - 3. Standby Power
- B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if

authorities having jurisdiction permit.

- b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
- c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- C. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- D. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- E. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- G. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces. Do not install in emergency electric power closets.
- I. Operating Instruction Signs:Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
 - J. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
 - 1. Labeling Instructions:
 - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION 260553

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Photoelectric switches.
 - 2. Indoor occupancy and vacancy sensors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Show installation details for the following:
 - a. Room Controllers.
 - b. Photocell/motion sensors
 - c. Occupancy sensors.
 - d. Vacancy sensors.
 - 2. Interconnection diagrams showing field-installed wiring.
 - 3. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and elevations, drawn to scale and coordinated with each other, using input from installers of the items involved.
- B. Field quality-control reports.
- C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
- B. Software and firmware operational documentation.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY AND VACANCY SENSORS

- A. General Requirements for Sensors:
 - 1. Wall and Ceiling-mounted, solid-state indoor occupancy sensors, dual technology.
 - 2. Separate power pack.
 - 3. Hardwired connection to switch; and BAS and lighting control system.
 - 4. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 5. Operation:
 - a. Vacancy Sensor: Unless otherwise indicated, turn lights on manually and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - b. Combination Sensor: Unless otherwise indicated, sensor shall be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - 6. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A Sensor is powered from the power pack.
 - 7. Power: Line voltage.
 - 8. Power Pack: two sets of dry contacts rated for 20-A LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 - 9. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 - 10. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 - 11. Bypass Switch: Override the "on" function in case of sensor failure.
 - 12. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
- B. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
 - 1. Sensitivity Adjustment: Separate for each sensing technology.
 - 2. Detector Sensitivity: Detect occurrences of 20-inch maximun movement of any portion of a human body that presents a target of not more than 20 feet and detect a person of average size and weight moving not more than 20 feet in either a horizontal or a vertical manner at an approximate speed of 20 feet.

2.2 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- C. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- D. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
- E. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structureborne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.2 WIRING INSTALLATION

- A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is ¾ inch.
- B. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's written instructions.
- C. Size conductors in accordance with lighting control device manufacturer's written instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

- A. Identify components and power and control wiring in accordance with Section 260553 "Identification for Electrical Systems."
- B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Lighting control devices will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
 - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
 - 2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.

3.6 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for 5 years.
- B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within 5 years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
 - 1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

John A. Bishop Elementary School Renovation Project Arlington Facilities Department 25 Columbia Road, Arlington, MA 02474 Audrey O'Hagan Architects Project No. 228.00 May 25, 2023

END OF SECTION 260923

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes LED luminaires:

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Luminaires shall comply with NEMA LE 4.

2.3 Surface Mounted:

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

- 1. TCP
- 2. XTRALIGHT
- 3. Mobern
- B. Nominal Operating Voltage: 120 V ac.
- C. Standards:
 - 1. DLC listed
 - 2. RoHS compliant.

2.4 MATERIALS

A. Metal Parts:

- 1. Free of burrs and sharp corners and edges.
- 2. Sheet metal components shall be steel unless otherwise indicated.
- 3. Form and support to prevent warping and sagging.
- B. Steel:
 - 1. ASTM A36/A36M for carbon structural steel.
 - 2. ASTM A568/A568M for sheet steel.
- C. Galvanized Steel: ASTM A653/A653M.

2.5 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.6 LUMINAIRE SUPPORT

- A. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- B. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- C. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- D. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Provide support for luminaire without causing deflection of ceiling or wall.
 - 3. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- E. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 265119

John A. Bishop Elementary School Office Renovation Project

Arlington Facilities Department Arlington, Massachusetts

CONSTRUCTION DOCUMENTS



Owner:

Town of Arlington, Facilities Department 25 Columbia Rd Arlington, MA 02474 781-316-3792

Architect:

Audrey O'Hagan Architects, LLC 63 Pleasant Street, Suite 300 Watertown, MA 02472 617.497.2007

MEP Consultant:

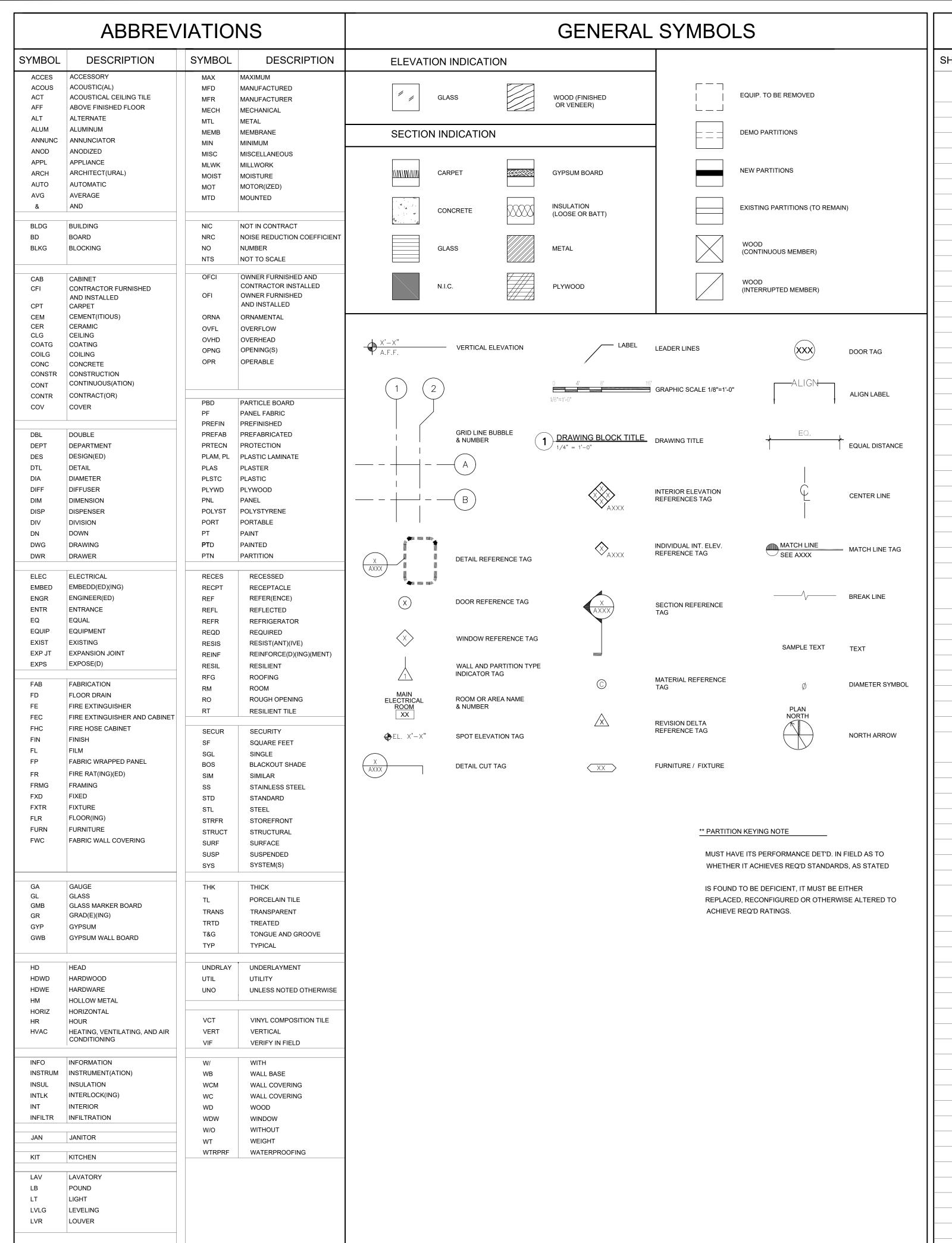
MacRitchie Engineering, Inc. 197 Quincy Avenue, Braintree, MA 02184 781.848.4464

CODE Consultant:

Jensen Hughes 33 Arch St, Boston, MA 02111 508.538.9409

25 May 2023





	DRAWINGS INDEX			
SHEET NO.	DRAWING TITLE	SDDE	CD	
	ARCHITECTURAL			
A-00	COVER SHEET	• •		
A-01	GENERAL NOTES, ABBREVIATIONS & DRAWING INDEX	• •	•	
A-10	FIRST FLOOR EGRESS PLAN	•	•	
A-11	FIRST FLOOR DEMOLITION PLAN	• •	•	
A-12	FIRST FLOOR PLAN	• •	•	
A-13	FIRST FLOOR REFLECTED CEILING PLAN	• •		
A-14	FIRST FLOOR FURNITURE & EQUIPMENT PLAN	• •	•	
A-20	FIRST FLOOR INTERIOR ELEVATIONS	• •	•	
A-40	DOOR SCHEDULE, DOOR & FRAME TYPES, DETAILS	•	•	
A-50	WALL SECTIONS	•	•	
A-51	SECTION DETAILS	•	•	
A-52	PARTITION TYPES & DETAILS	•	•	
A-55	MILLWORK	•		
	FIRE PROTECTION			
FP-1.0	FIRE PROTECTION DEMOLITION AND NEW WORK PLANS			
			+++	
			+++	
			+++	
			+++	
			+++	
			+++	

PLUMBING

	LOWBING			
P-1.0	PLUMBING DEMOLITION AND NEW WORK PLANS	•		
	MECHANICAL			
M-0.1	MECHANICAL LEGEND, NOTES, & ABBREVIATIONS	•	•	

M-0.1	MECHANICAL LEGEND, NOTES, & ABBREVIATIONS		
M-1.0	MECHANICAL DEMOLITION AND NEW WORK PLANS	•	
M-2.0	MECHANICAL DETAILS & SCHEDULES	•	

ELECTRICAL

ELECTRICAL LEGEND, NOTES, & ABBREVIATIONS

E-1.0	ELECTRICAL DEMOLITION AND NEW POWER AND DATA PLANS		•
E-1.1	ELECTRICAL DEMOLITION AND NEW LIGHTING PLANS	•	•
FA-0.0	FIRE ALARM LEGEND, NOTES AND ABBREVIATIONS		•
FA-0.1	FIRE ALARM DEMOLITION AND NEW PLANS	•	•

GENERAL NOTES

- 1. COMPLY WITH CODES, LAWS, ORDINANCES, RULES, AND REGULATIONS OF PUBLIC AUTHORITIES GOVERNING THE
- 2. OBTAIN AND PAY FOR PERMITS AND INSPECTIONS REQUIRED BY PUBLIC AUTHORITIES GOVERNING THE WORK.
- 3. GENERAL CONTRACTOR TO REVIEW DOCUMENTS, VERIFY DIMENSIONS AND FIELD CONDITIONS AND CONFIRM THAT WORK IS BUILDABLE AS SHOWN PRIOR TO ORDERING MATERIALS OR FABRICATING. REPORT ANY CONFLICTS OR OMISSIONS TO THE ARCHITECT FOR CLARIFICATION PRIOR TO PERFORMING ANY WORK IN QUESTION.
- 4. COORDINATE WORK WITH THE OWNER, INCLUDING SCHEDULING TIME AND LOCATIONS FOR DELIVERIES, BUILDING ACCESS, USE OF BUILDING SERVICES AND FACILITIES MINIMIZE DISTURBANCE OF BUILDING FUNCTIONS AND OCCUPANTS.
- 5. INCLUDE SCHEDULE REQUIREMENTS IN CONSTRUCTION PROGRESS. SCHEDULE AND COORDINATE TO ASSURE ORDERLY SEQUENCE OF INSTALLATION.
- 6. SUBMIT REQUESTS FOR SUBSTITUTIONS, REVISIONS, OR CHANGES TO ARCHITECT FOR REVIEW AND APPROVAL PRIOR TO PURCHASE, FABRICATION, OR INSTALLATION. SUBMIT ALL FINISH SAMPLES TO ARCHITECT FOR APPROVAL.
- 7. PROTECT AREA OF WORK AND ADJACENT AREAS FROM DAMAGE.
- 8. MAINTAIN EXITS, FIRE PROTECTIVE DEVICES, AND ALARMS IN CONFORMANCE WITH CODES AND ORDINANCES.
- 9. DO NOT SCALE DRAWINGS. IN CASE OF CONFLICT, CONSULT THE ARCHITECT.
- 10. COORDINATE AND PROVIDE BLOCKING FOR MILLWORK AND ITEMS ATTACHED OR MOUNTED TO WALLS OR CEILINGS.
- 11. ISOLATE INCOMPATIBLE METALS TO PREVENT GALVANIC REACTION.
- 12. WOOD BLOCKING SHALL BE FIRE TREATED IN ACCORDANCE WITH APPLICABLE CODE REQUIREMENTS.
- 13. PARTITIONS ARE DIMENSIONED FROM FINISH FACE TO FINISH FACE, UNLESS NOTED OTHERWISE. MAINTAIN DIMENSIONS MARKED "CLEAR". ALLOW FOR THICKNESS OF FINISHES.
- 14. GENERAL CONTRACTOR TO COORDINATE PUBLIC ACCESS DURING CONSTRUCTION. BUILDING IS TO REMAIN OPERATIONAL AND ACCESSIBLE AT ALL TIMES DURING CONSTRUCTION. MAINTAIN EXISTING REQUIRED EGRESS ROUTES AND EXITS, FIRE PROTECTION DEVICES, AND SANITARY FACILITIES. WASTE MATERIALS SHALL BE REMOVED.
- 14. FIELD VERIFY EXISTING CONDITIONS PRIOR TO PURCHASING MATERIALS

APPLICABLE CODES AND REQUIREMENTS

The following codes are presently adopted in the State of Massachusetts:

Massachusetts Architectural Access Board Regulations (521 CMR) and the Americans with Disabilities Act 2010 Standards for Accessible Design (ADA)

Massachusetts State Building Code (780 CMR), 9th edition, based on the 2015 International Building Code

Massachusetts Electrical Code (527 CMR 12), based on the 2020 National Electrical Code(NFPA 70)

Massachusetts Elevator Regulations (524 CMR), based on the 2013 ASME A17.1, Safety Code for Elevators and Escalators

780 CMR Chapter 13 Energy Efficiency (780 CMR 13), based on the 2018 International Energy Conservation Code

780 CMR Chapter 34 Existing Buildings Code (780 CMR 34), based on the 2015 International Existing Building Code (IEBC)

Massachusetts Fire Prevention Regulations (527 CMR 1), based on the 2015 edition of NFPA 1.2

780 CMR Chapter 28 (780 CMR 28), based on the 2015 International Mechanical Code

Massachusetts Uniform State Plumbing Code (248 CMR 10).

National Fire Protection Association (NFPA) Standards as referenced by 780 CMR and 527 CMR 1 including, but not limited to:

NFPA 10, 2013 edition, Standard for Portable Fire Extinguishers NFPA 72, 2013 edition, National Fire Alarm and Signaling Code



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CODE CONSULTANT:

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CLIENT



TOWN OF ARLINGTON **FACILITIES DEPARTMENT** 869 MASSACHUSETTS AVE ARLINGTON, MA, 02476 781-316-3110

PROJECT

JOHN A. BISHOP ELEMENTARY SCHOOL OFFICE RENOVATION PROJECT 25 COLUMBIA RD ARLINGTON, MA, 02474

REVISIONS

	·

CONSTRUCTION **DOCUMENTS**

PROJECT NO:	228.00
DRAWN BY:	AOHA
DATE:	25 MAY 2023

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SHEET TITLE

General Notes, Abbreviations, and Drawing Index

CODE INFORMATION

PROJECT DESCRIPTION

The project consists of a footprint area of approximately 1,017 square feet and currently used for office space for the John Bishop Elementary School and the use is anticipated to remain after the renovation.

The existing building includes steps at the entry and a ramp, the building is sprinklered. The project scope of work will be limited to rehabilitation at Level 2.

USE AND OCCUPANCY

The project is classified as a **Level 2 Alteration** per 780 CMR 34.

The project maintains the existing occupancy of the existing building. The areas to be renovated are Classified as Use Group B, Business.

CODE REFERENCE

Work shall conform to the requirements of the following partial list of applicable codes and regulations. The general contractor shall comply with all applicable codes, ordinances, regulations and requirements of all authorities having jurisdiction.

The following codes and standards are applicable to this project.

Accessibility - Massachusetts Architectural Access Board Regulations (521 CMR) and the Americans with Disabilities Act 2010 Standards for Accessible Design

Building - Massachusetts State Building Code (780 CMR), 9th edition, based on the 2015 International Building Code.

Electrical - Massachusetts Electrical Code (527 CMR 12), based on the 2023 National Electrical Code (NFPA 70), which is expected to be effective beginning January 1, 2023. Note, the applicable electrical code is based on the issuance of the electrical trade

Elevator - Massachusetts Elevator Regulations (524 CMR), based on the 2013 ASME A17.1, Safety Code for Elevators and Escalators.

Energy Conservation - 780 CMR Chapter 13, Energy Efficiency (780 CMR 13), based on the 2018 International Energy Conservation Code (IECC).

Existing Building - Massachusetts State Building Code Chapter 34 Existing Buildings Code (780 CMR 34), based on the 2015 International Existing Building Code (IEBC).

Fire Prevention - Massachusetts Fire Prevention Regulations (527 CMR 1), based on the 2015 edition of NFPA 1.

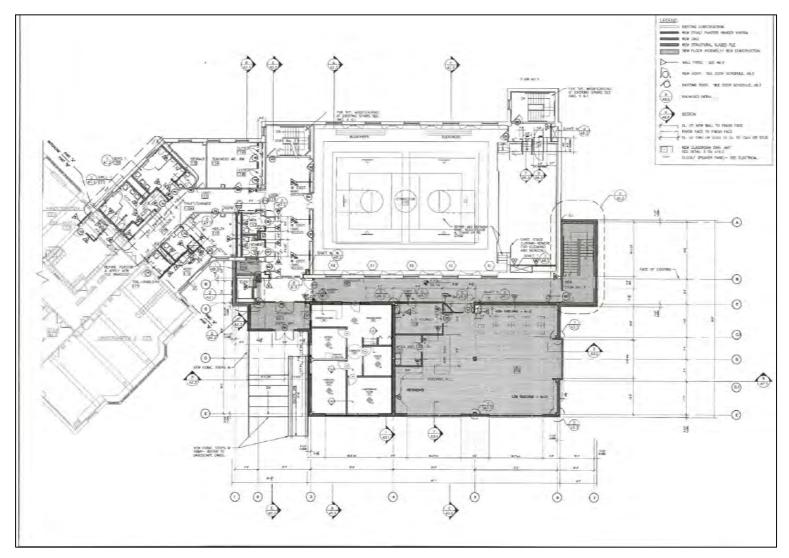
Mechanical - 780 CMR Chapter 28 (780 CMR 28), based on the 2015 International Mechanical Code.

Plumbing - Massachusetts Uniform State Plumbing Code (248 CMR 10).

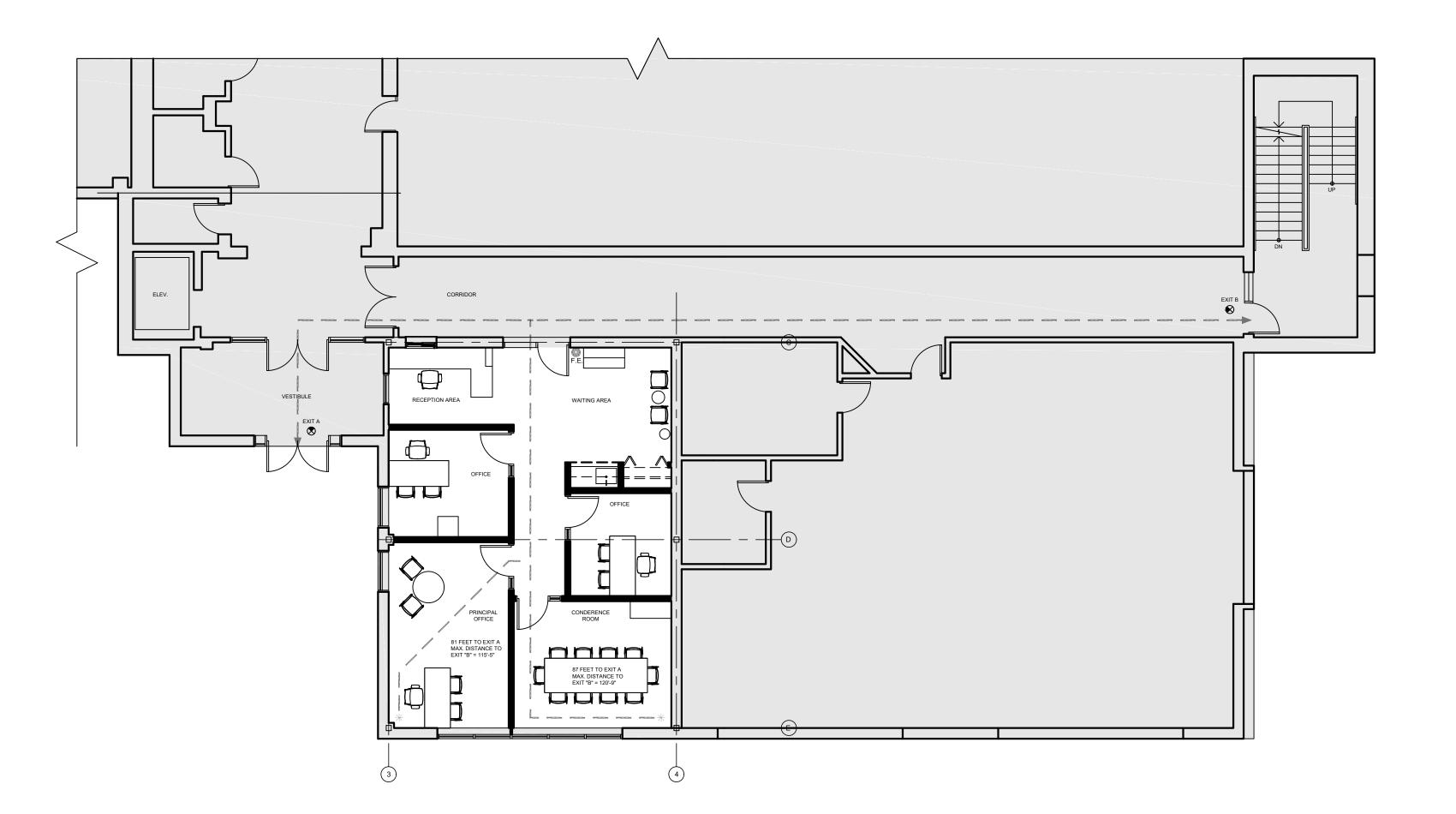
Other - National Fire Protection Association (NFPA) Standards as referenced by 780 CMR and 527 CMR 1 including, but not limited to:

- NFPA 10, 2013 edition, Standard for Portable Fire Extinguishers
- NFPA 13, 2013 edition, Standard for the Installation of Sprinkler Systems - NFPA 72, 2013 edition, National Fire Alarm and Signaling Code

Jensen Hughes assumes that there are no existing abatement orders for the building and therefore the existing number of means of egress and existing lighting and ventilation are assumed to be adequate.



OVERALL FIRST FLOOR PLAN 1/32" = 1'-0"



\ PARTIAL FIRST FLOOR EGRESS PLAN

SYMBOLS LEGEND

EXISTING PARTITION

NEW PARTITION



NOT IN CONTRACT



EXIST SIGNAGE



FIRE EXTINGUISHER WALL MOUNTED



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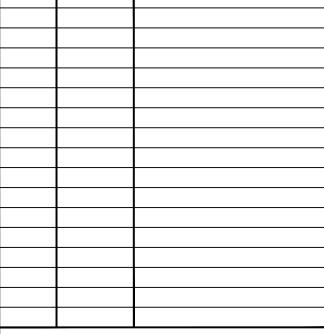


TOWN OF ARLINGTON FACILITIES DEPARTMENT 869 MASSACHUSETTS AVE ARLINGTON, MA, 02476 781-316-3110

PROJECT

JOHN A. BISHOP ELEMENTARY SCHOOL OFFICE RENOVATION PROJECT 25 COLUMBIA RD ARLINGTON, MA, 02474

REVISIONS

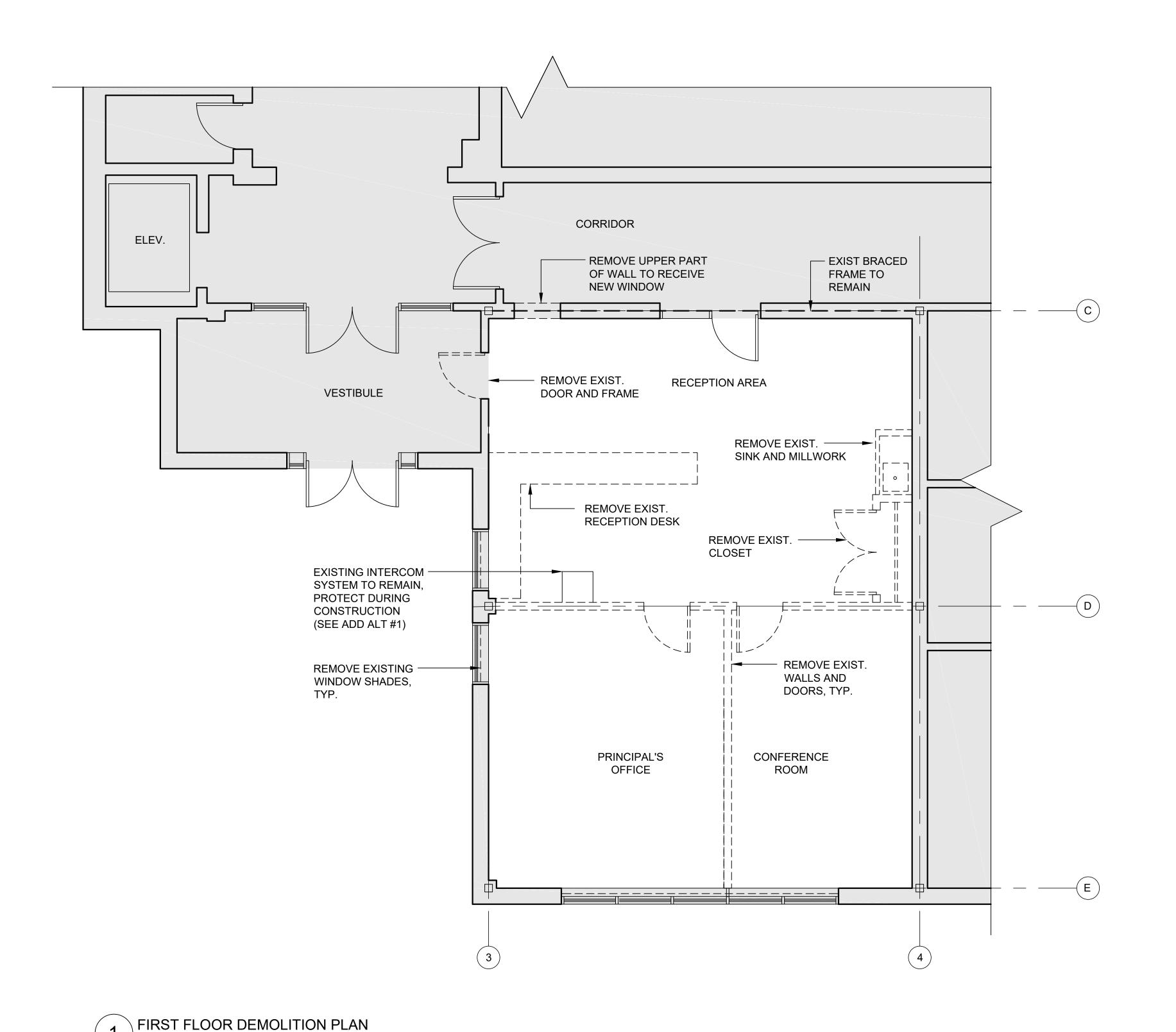


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SHEET TITLE

First Floor Egress Plan



1/4" = 1'-0"

DEMO PARTITIONS, DOORS, ETC.

SYMBOLS LEGEND

EXISTING PARTITIONS (TO REMAIN)

N.I.C.

DEMOLITION NOTES

- 1) THE DEMOLITION DWGS INDICATE THE GENERAL EXTENT OF THE DEMOLITION, REMOVALS AND ALTERATIONS TO BE PERFORMED. PRIOR TO COMMENCING ANY DEMOLITION AND REMOVAL WORK, CAREFULLY EXAMINE ALL CONDITIONS AS THEY EXIST AT THE PROJECT AND VERIFY WITH THE ARCHITECT THE ACTUAL EXTENT OF THE DEMOLITION AND REMOVAL WORK. THE CONTRACTOR AND/OR APPROPRIATE SUB-CONTRACTORS ARE RESPONSIBLE FOR REMOVING ALL EXISTING MATERIALS THAT WOULD OTHERWISE INTERFERE WITH THE PROPER INSTALLATION OR FUNCTION OF THE NEW WORK WHETHER OR NOT SUCH EXISTING MATERIALS OR CONDITIONS HAVE BEEN INDICATED.
- 2) PATCH AND REPAIR WALLS, FLOORS, AND CEILINGS AS NEEDED.
- 3) PREP EXISTING FLOOR TO RECEIVE NEW CARPET
- 4) REFER TO ARCHITECTURAL, MECH, ELECTRIC, PLUMBING DRAWINGS FOR FULL EXTENT OF DEMOLITION.
- 5) REMOVE ALL EXISTING WINDOW TREATMENTS.
- 6) DEMOLISH EXISTING CEILINGS, CEILING TILES AND LIGHT FIXTURES.

ADD ALTERNATES

1) REMOVE AND RELOCATE EXISTING INTERCOM SYSTEM.



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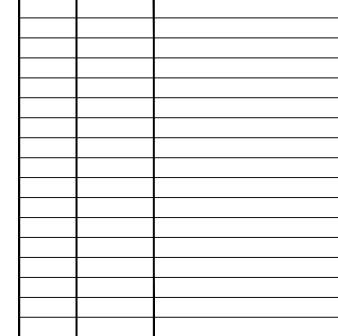


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REVISIONS



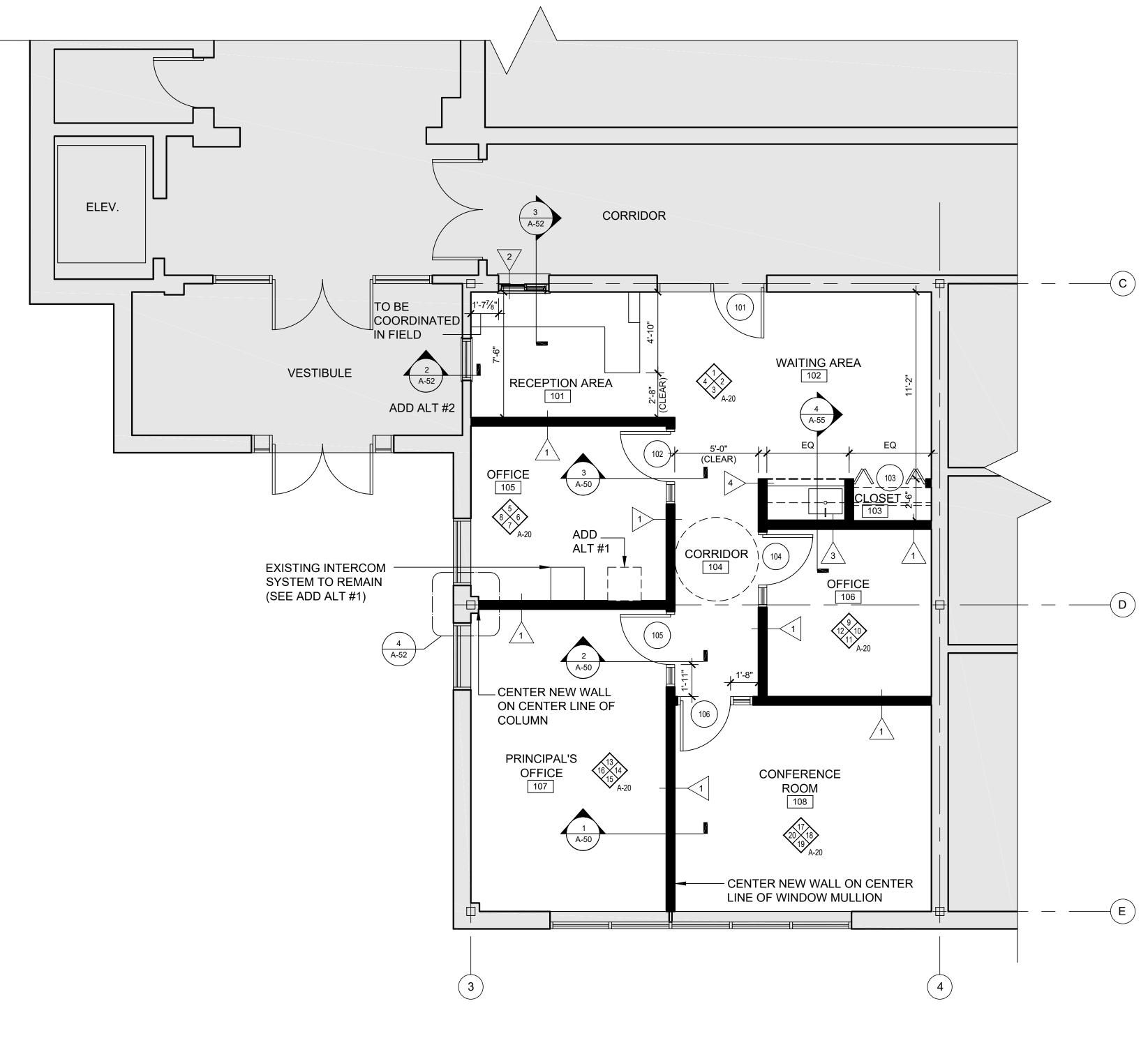
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SHEET TITLE

First Floor Demolition Plan



FIRST FLOOR PLAN 1/4" = 1'-0"

FINISH SPECIFICATION

ACOUSTIC CEILING TILES

ARMSTRONG CEILING SYSTEMS: PRODUCT: ULTIMA BELEVED TEGULAR COLOR: WHITE SIZE: 24" X 24" X 3/4"

SUSPENSION SYSTEM: SUPRAFINE XL 9/16"

FLOOR FINISH

CPT MILLIKEN; CARPET TILES **COLLECTION: WHALE SONG DESIGN NAME: BELUGA** COLOR NAME: BEL 19 COASTLINE

PAINT COLORS / FINISH

PT-1 BENJAMIN MOORE, COLOR PREVIEW, WHITE DOVE OC-17 (EGGSHELL FINISH)

PT-2 BENJAMIN MOORE, COLOR PREVIEW, COLOR/FINISH: TBD BENJAMIN MOORE, COLOR PREVIEW, COLOR/FINISH: TBD BENJAMIN MOORE, COLOR PREVIEW, COLOR/FINISH: TBD

METAL FRAMES TO MATCH EXISTING

BENJAMIN MOORE, WATERBORNE CEILING PAINT, ULTRA WHITE (FLAT FINISH)

MARKERBOARD PAINT

PT-8 BENJAMIN MOORE, BLACK

WINDOW SHADES

MATCH EXISTING BUILDING STANDARDS

RUBBER BASE

RB-1 RUBBER WALL BASE PRODUCT: JOHNSONITE BASEWORK THERMOSET RUBBER WALL BASE STYLE: STRAIGHT HEIGHT: 4" COLOR: BLACK

SOLID SURFACE MATERIAL

SSM-1 PRODUCT: AVONITE SURFACES **COLOR: AVENUE GREY 7612**

PRODUCT: DURASEIN **COLOR: BARBOR MIST DM5001**

SYMBOLS LEGEND

EXISTING PARTITION NEW PARTITION NOT IN CONTRACT

GENERAL NOTES

- 1. COMPLY WITH CODES, LAWS, ORDINANCES, RULES, AND REGULATIONS OF PUBLIC AUTHORITIES GOVERNING THE WORK.
- 2. OBTAIN AND PAY FOR PERMITS AND INSPECTIONS REQUIRED BY PUBLIC AUTHORITIES GOVERNING THE WORK.
- 3. GENERAL CONTRACTOR TO REVIEW DOCUMENTS. VERIFY DIMENSIONS AND FIELD CONDITIONS AND CONFIRM THAT WORK IS BUILDABLE AS SHOWN PRIOR TO ORDERING MATERIALS OR FABRICATING. REPORT ANY CONFLICTS OR OMISSIONS TO THE ARCHITECT FOR CLARIFICATION PRIOR TO PERFORMING ANY WORK IN QUESTION.
- 4. COORDINATE WORK WITH THE OWNER, INCLUDING SCHEDULING TIME AND LOCATIONS FOR DELIVERIES, BUILDING ACCESS, USE OF BUILDING SERVICES AND FACILITIES. MINIMIZE DISTURBANCE OF BUILDING FUNCTIONS AND OCCUPANTS.
- 5. INCLUDE SCHEDULE REQUIREMENTS IN CONSTRUCTION PROGRESS SCHEDULE AND COORDINATE TO ASSURE ORDERLY SEQUENCE OF INSTALLATION.
- 6. SUBMIT REQUESTS FOR SUBSTITUTIONS, REVISIONS, OR CHANGES TO ARCHITECT FOR REVIEW AND APPROVAL PRIOR TO PURCHASE, FABRICATION, OR INSTALLATION. SUBMIT ALL FINISH SAMPLES TO ARCHITECT FOR APPROVAL
- 7. PROTECT AREA OF WORK AND ADJACENT AREAS FROM DAMAGE.
- 8. MAINTAIN EXITS, FIRE PROTECTIVE DEVICES, AND ALARMS IN CONFORMANCE WITH CODES AND ORDINANCES.
- 9. DO NOT SCALE DRAWINGS. IN CASE OF CONFLICT, CONSULT THE ARCHITECT.
- 10. COORDINATE AND PROVIDE BLOCKING FOR MILLWORK AND ITEMS ATTACHED OR MOUNTED TO WALLS OR CEILINGS.
- 11. ISOLATE INCOMPATIBLE METALS TO PREVENT GALVANIC REACTION.
- 12. WOOD BLOCKING TO BE PROVIDED FOR WALL-MOUNTED EQUIP AND WHERE REQUIRED.
- 13. WOOD BLOCKING SHALL BE FIRE TREATED IN ACCORDANCE

WITH APPLICABLE CODE REQUIREMENTS.

- 14. PARTITIONS ARE DIMENSIONED FROM FINISH FACE TO FINISH FACE, UNLESS NOTED OTHERWISE. MAINTAIN DIMENSIONS MARKED "CLEAR". ALLOW FOR THICKNESS OF FINISHES.
- 15. GENERAL CONTRACTOR TO COORDINATE PUBLIC ACCESS DURING CONSTRUCTION. BUILDING IS TO REMAIN OPERATIONAL AND ACCESSIBLE AT ALL TIMES DURING CONSTRUCTION. MAINTAIN EXISTING REQUIRED EGRESS ROUTES AND EXITS, FIRE PROTECTION DEVICES, AND SANITARY FACILITIES. WASTE MATERIALS SHALL BE REMOVED.
- 16. ALL NEW PARTITIONS TO BE 3 5 MTL STUDS WITH 5 DRY WALL EACH SIDE UNLESS OTHERWISE NOTED
- 17. FIELD VERIFY EXISTING CONDITIONS PRIOR TO PURCHASING MATERIALS.
- 18. CARPET TILES TO BE FROM ONE DYE LOT.
- 19. ALL METAL DOOR AND NEW WINDOW FRAMES TO MATCH EXIST.
- 20. ALL CEILINGS TO BE BENJAMIN MOORE, WATERBORNE CEILING PAINT, ULTRA WHITE (FLAT FINISH)

ADD ALTERNATES

- 1. REMOVE AND RELOCATE EXISTING INTERCOM SYSTEM
- 2. PROVIDE BULLET-PROOF GLASS.



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PROJECT

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REVISIONS

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DATE:	25 MAY 2023	
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SHEET TITLE

First Floor Plan

0 0 0 0 CENTER GRID ON — CORRIDOR

FIRST FLOOR REFLECTED CEILING PLAN

1/4" = 1'-0"

SYMBOLS LEGEND

EXISTING PARTITION

NEW PARTITION

NOT IN CONTRACT

2' X 2' ACOUS CEILING TILE ON SUSP METAL GRID

_ _ _ _ LINEAR UNDER CABINET LIGHT FIXTURE, RE: ELEC

——— MANUAL OPERATED WINDOW SHADE

SUSPENDED ACOUSTIC CEILING SYSTEM

RECESSED LIGHT FIXTURE 2' X 2'

MECHANICAL AIR SUPPLY DIFFUSER

MECHANICAL AIR RETURN REGISTER - GRILL

PENDANT SPRINKLER HEAD

O RECESSED LED LIGHT FIXTURE

⊗ LED EXIT SIGN (CEILING-MOUNT)

FIRE EXTINGUISHER WALL MOUNTED



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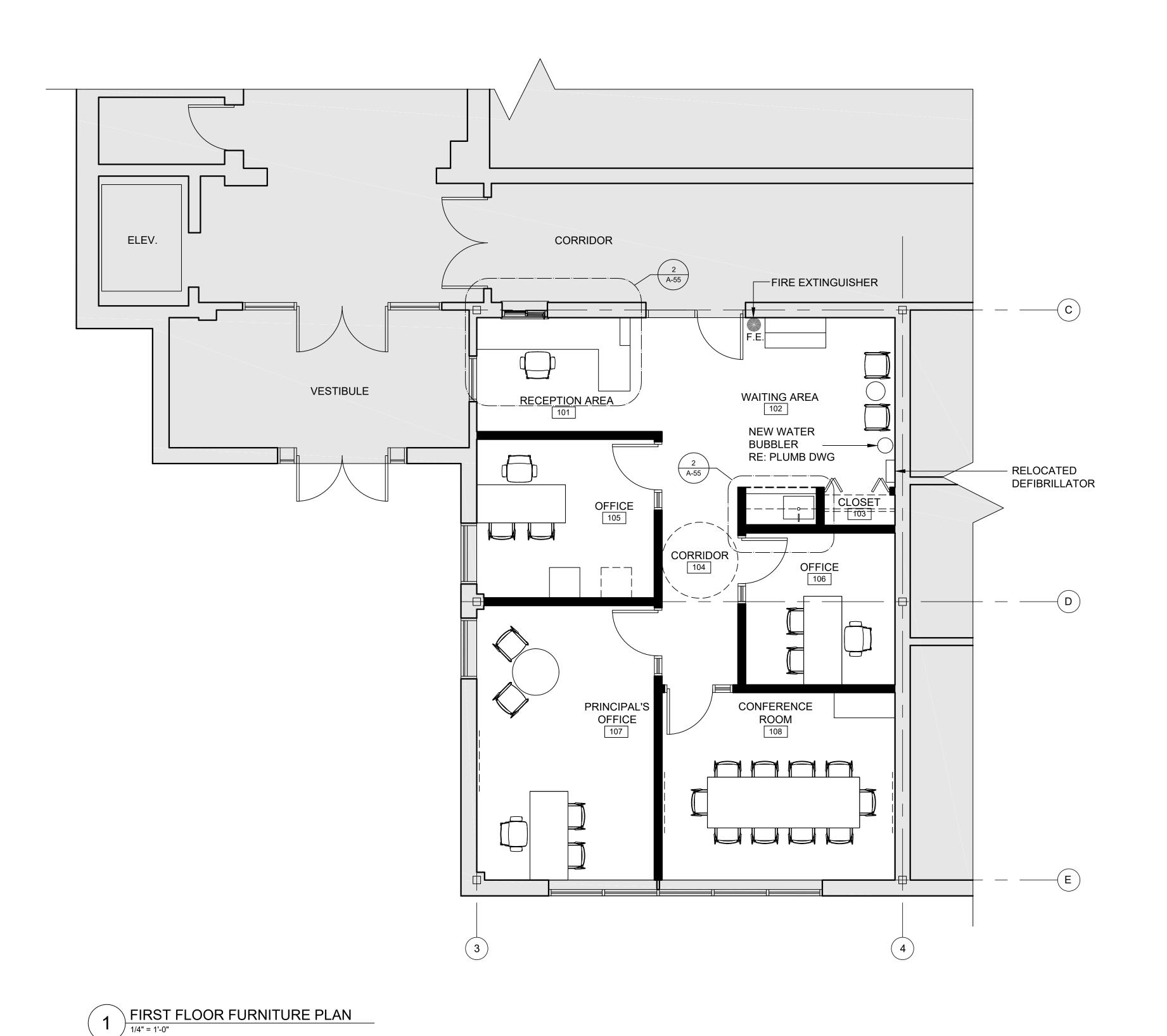
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SHEET TITLE

First Floor Reflected Ceiling Plan



SYMBOLS LEGEND

EXISTING PARTITION

NEW PARTITION

NOT IN CONTRACT

---- FIRE-TREATED BLOCKING

GENERAL NOTES

- 1) ALL FURNITURE TO BE OWNER SUPPLIED AND INSTALLED UNLESS OTHERWISE NOTED.
- 2) ALL APPLIANCES TO BE OWNER SUPPLIED CONTRACTOR INSTALLED UNLESS OTHERWISE NOTED.
- 3) ADD NEW FIRE-TREATED BLOCKING IN LOCATIONS SHOWN DASHED FOR FUTURE FLAT PANEL MONITORS.



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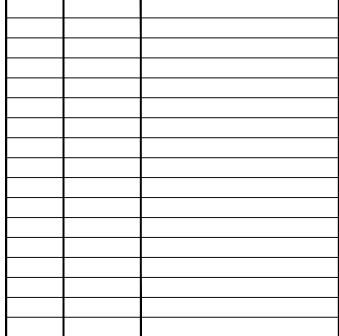


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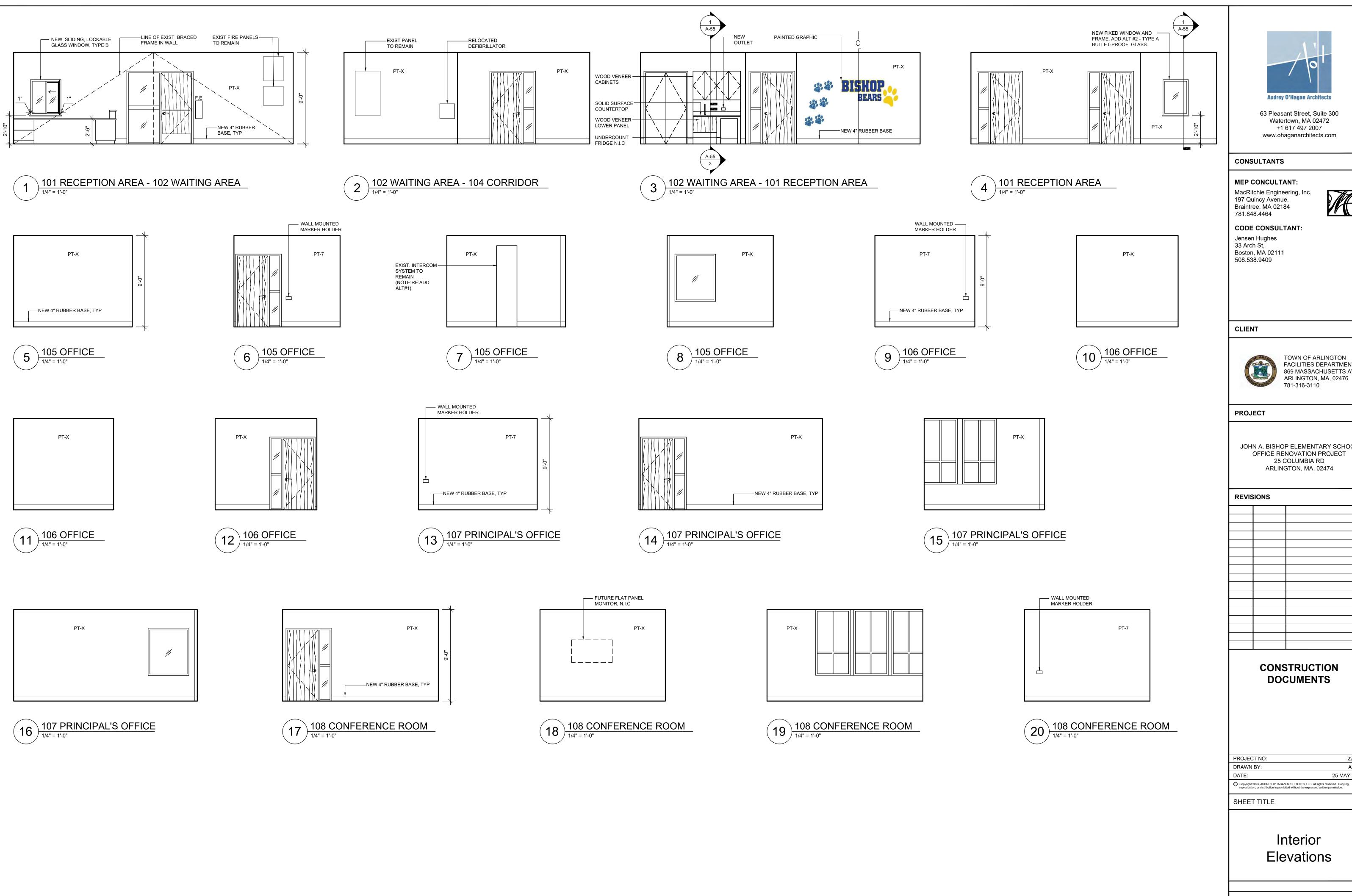


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SHEET TITLE

First Floor Furniture & **Equipment Plan**



TOWN OF ARLINGTON FACILITIES DEPARTMENT 869 MASSACHUSETTS AVE ARLINGTON, MA, 02476

JOHN A. BISHOP ELEMENTARY SCHOOL OFFICE RENOVATION PROJECT

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DATE:	25 MAY 2023
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DOOR AND FRAME SCHEDULE

SEE DOOR

SCHEDULE

DOOR TYPES

SEE DOOR

SCHEDULE

EXISTING

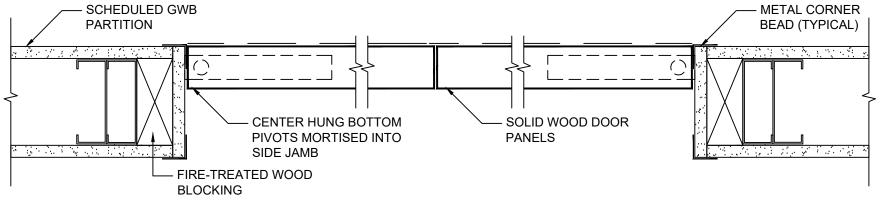
		ROOM		DOOR				FRAME			PAINT	HARDWARE			FIRE NOTES	
DOOR NO.	ROOM NAME		SWING	SIZE WxH	MATERIAL	THK.	TYPE	FIN. TYPE	PARTITION DEPTH	MATERIAL	FIN.	COLOR	SET	KEY FUNCTION	DOOR LOCKSET	RATING NOTES
101	RECEPTION AREA	101	LH	3'-0"x7'-0"	EXIST	1 3 "	EXIST	EXIST	SEE PLAN	EXIST	PAINT	PT-5	1	EXIST.	EXIST.	- EXIST DOOR, FRAME AND HARDWARE. PAINT FRAME TO MATCH EXIST.
102	OFFICE	105	RH	3'-0"x7'-0"	WD	1 3 "	F	А	SEE PLAN	НМ	PAINT	PT-5	-	EXIST.	MATCH	- MATCH EXIST HARDWARE AND LOCKSETS; OAK
103	CLOSET	103	-	3'-0"x7'-0"	WD	1 3 "	F	-	SEE PLAN	-	-	-	-	-	-	- PIVOT HINGE
104	OFFICE	106	LH	3'-0"x7'-0"	WD	1 3 "	F	А	SEE PLAN	НМ	PAINT	PT-5	-	EXIST.	MATCH	- MATCH EXIST HARDWARE AND LOCKSETS.
105	PRINCIPAL'S OFFICE	107	RH	3'-0"x7'-0"	WD	1 3 "	F	А	SEE PLAN	НМ	PAINT	PT-5	-	EXIST.	MATCH	- MATCH EXIST HARDWARE AND LOCKSETS.
106	CONFERENCE ROOM	108	RH	3'-0"x7'-0"	WD	1 3 "	F	А	SEE PLAN	НМ	PAINT	PT-5	-	EXIST.	MATCH	- MATCH EXIST HARDWARE AND LOCKSETS.

GENERAL NOTES:

6'-6¹/2"

EXISTING

- WOOD PANELS SHOULD BE MAPLE OR OAK WOOD VENEER, QUARTER SLICED AND SLIP MATCHED. ALSO SAME FLITCH.
- 2. WOOD DOORS SHOULD BE A CUSTOM GRADE WOOD VENEER IN QUARTER SLICED OAK, BOOK MATCHED.
- 3. CONTRACTOR SHALL SUBMIT SAMPLES FOR ARCHITECTS APPROVAL.
- 4. HARDWARE SET, CLOSERS AND KICKPLATES TO MATCH EXIST.
- 5. FRAME COLOR TO MATCH EXIST.





WINDOW SCHEDULE

3'-6"

3'-6"

2. REFER TO SPEC. SECT. 08800 FOR DESCRIPTION OF GLAZING TYPES.

4. WINDOW FRAME COLOR TO MATCH EXIST DOOR FRAMES.

2'-6"

GENERAL NOTES:

2 / A-52 | 2 / A-52, SIM | 5 / A-52

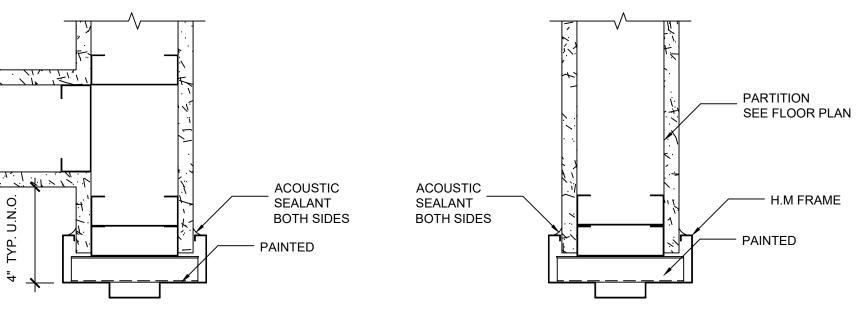
3 / A-52 | 3 / A-52, SIM | 6 / A-52

ALL WINDOW OPENINGS TO BE FIELD MEASURED AND COORDINATED WITH WINDOW MANUFACTURER.

5. TYPE A: FIXED PANEL; 1/4" TEMPERED GLASS. SEE ADD ALT #1 FOR BULLET RESISTANT GLASS.

3. REFER TO AND COORDINATE DETAILS & ELEVATIONS FOR FULL EXTENT OF WORK BY WINDOW MANUFACTURER.

6. TYPE B: MANUAL OPEN/SELF CLOSE; LEFT TO RIGHT SLIDER FROM CORRIDOR; 1/4" TEMPERED GLASS; LOCKABLE.







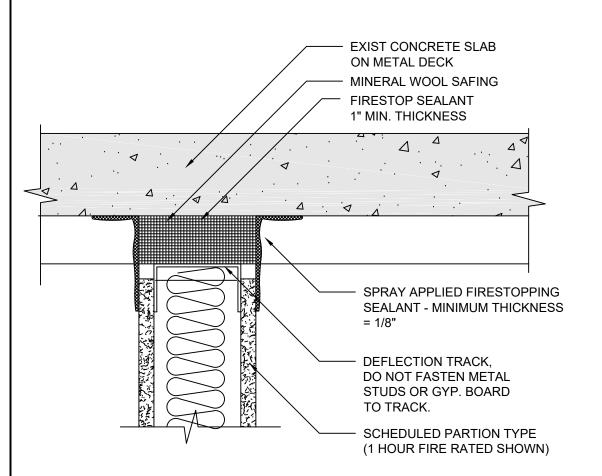
REMARKS

BASIS OF DESIGN: US BULLET PROOFING, PRODUCT: USAW 300 SERIES INTERIOR

FIXED ALUMINUM WINDOW SYSTEM WITH 1/4" TEMPERED GLASS. RE: ADD ALT #1.

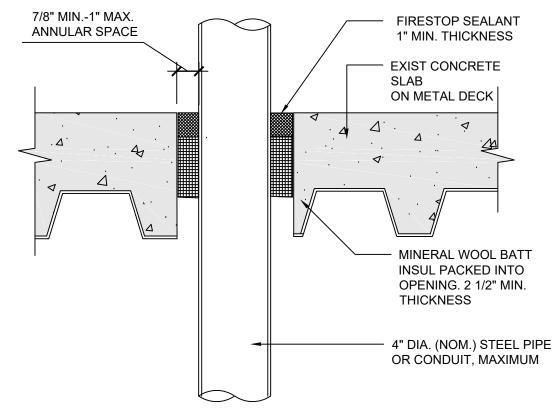
BASIS OF DESIGN: US BULLET PROOFING, PRODUCT: USAW 100 SERIES SLIDING

ALUMINUM WINDOW SYSTEM WITH 1/4" TEMPERED GLASS.



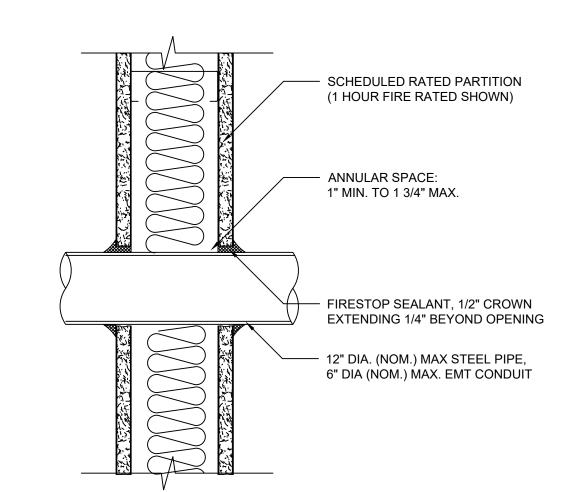
3 RATED PARTITION HEAD DETAIL

3" = 1'-0" ONE AND TWO HOLD BATES. ONE AND TWO HOUR RATED U.L. HW-D-0538 NOTE: 1 HOUR RATED PARTITION SHOWN

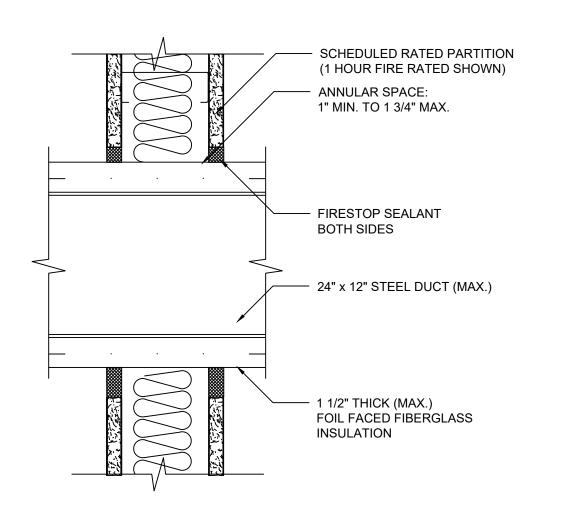


3'-0"

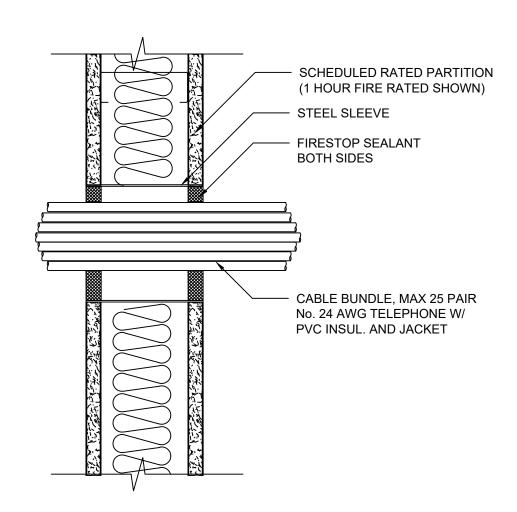
4 FLOOR PENETRATION FIRESTOPPING DETAIL PIPE PENETRATION - 1 & 2 HOUR - U.L. NO. C-AJ-1151



PARTITION FIRESTOPPING DETAIL PIPE PENETRATION - 1 & 2 HOUR - U.L. NO. W-L-1085 NOTE: 1 HOUR RATED PARTITION SHOWN



PARTITION FIRESTOPPING DETAIL DUCT PENETRATION - 1 & 2 HOUR - U.L. NO. W-L-7059 NOTE: 1 HOUR RATED PARTITION SHOWN



PARTITION FIRESTOPPING DETAIL

DUCT PENETRATION - 1 & 2 HOUR - U.L. NO. W-L-3065 NOTE: 1 HOUR RATED PARTITION SHOWN



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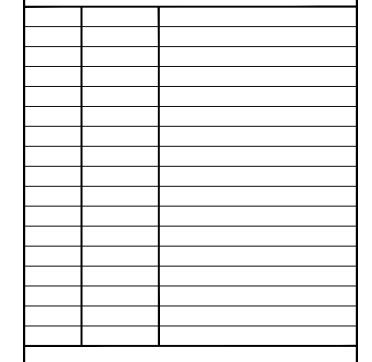


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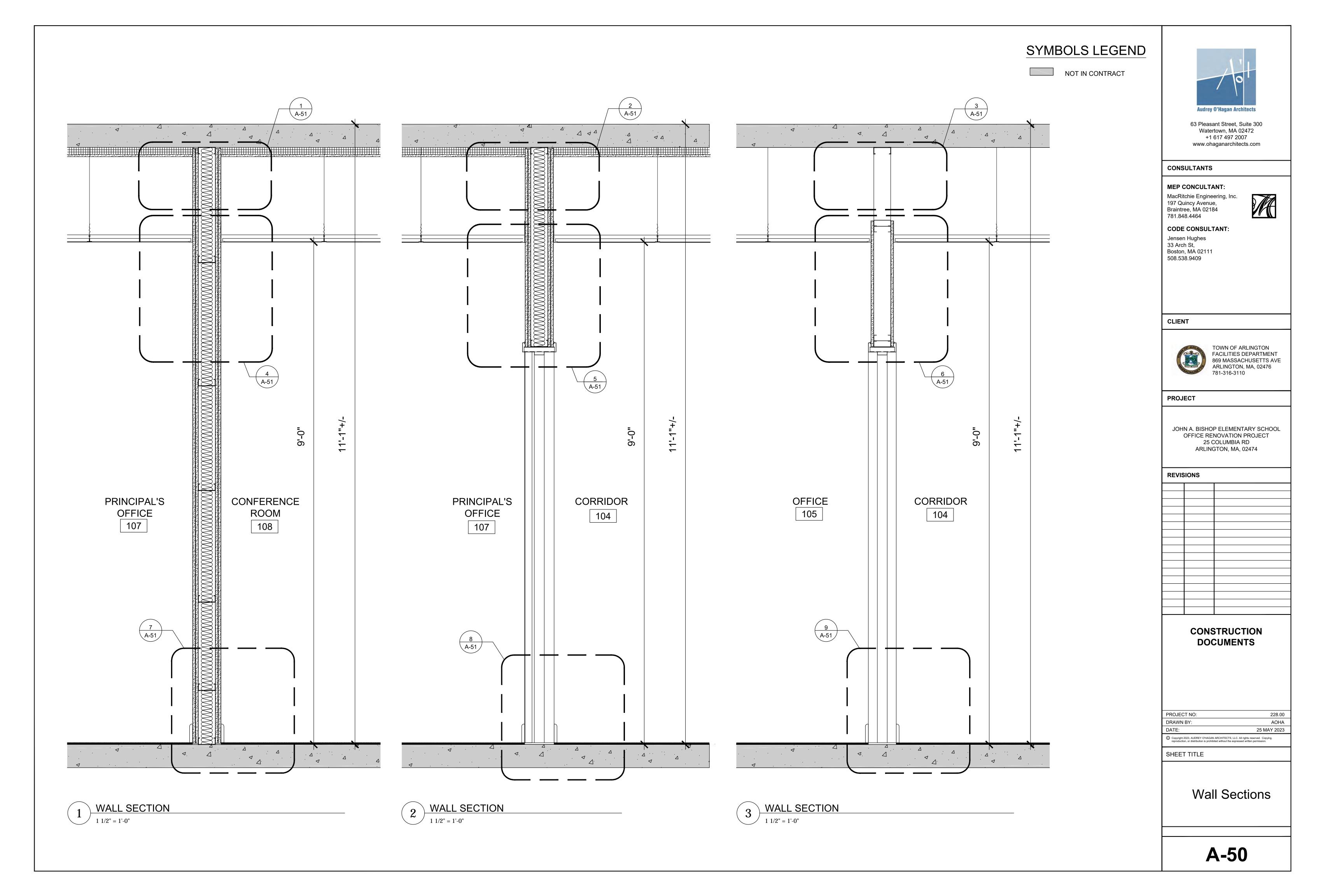
Door Schedule, Door & Frame Types, Details

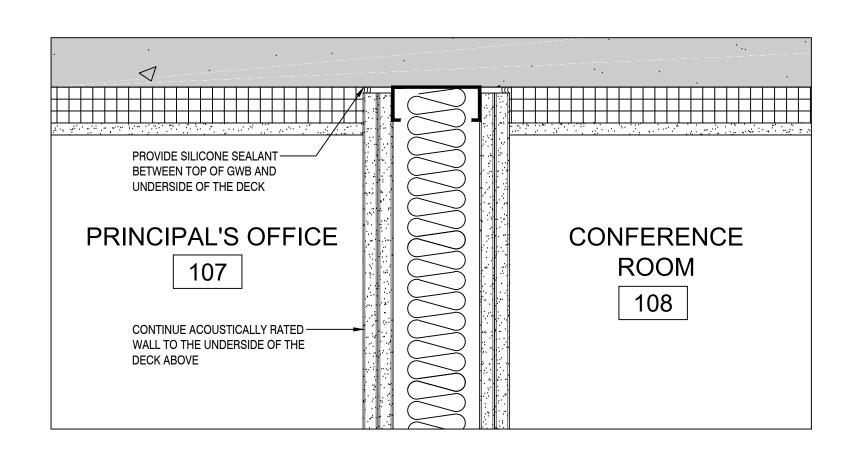
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T1 RESILIENT FLOORING TO CARPET TRANSITION

6" = 1'-0"

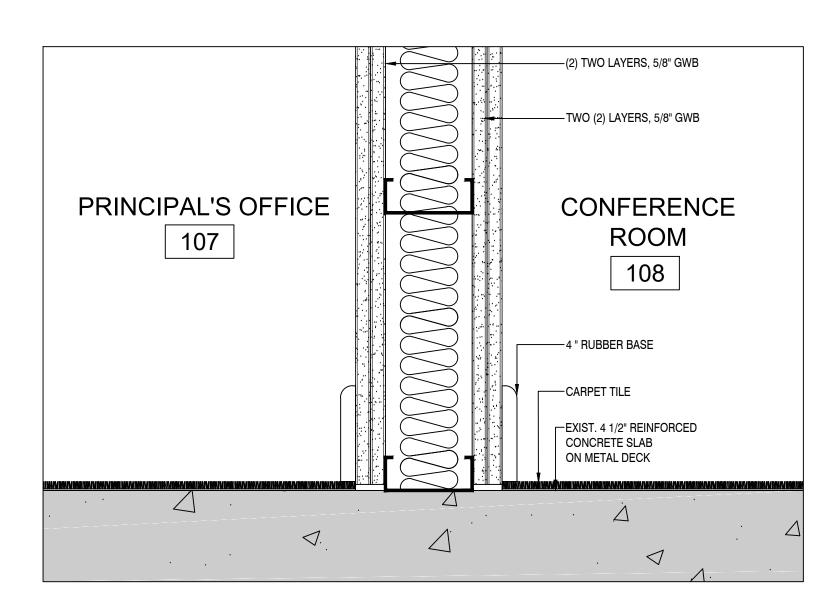




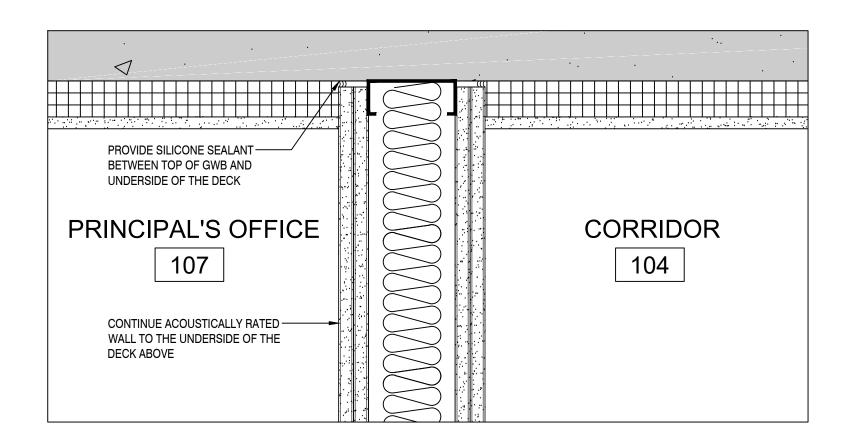
PARTIAL SECTION DETAIL 3" = 1'-0"

-2'x2' SUSPENDED ACOUSTIC CEILING SYSTEM -2 LAYERS - 5/8" GWB ─3 5/8" METAL STUD WALL 2 LAYERS - 5/8" GWB-WITH ACOUSTICAL BATT INSULATION PRINCIPAL'S OFFICE CONFERENCE ROOM 107 108

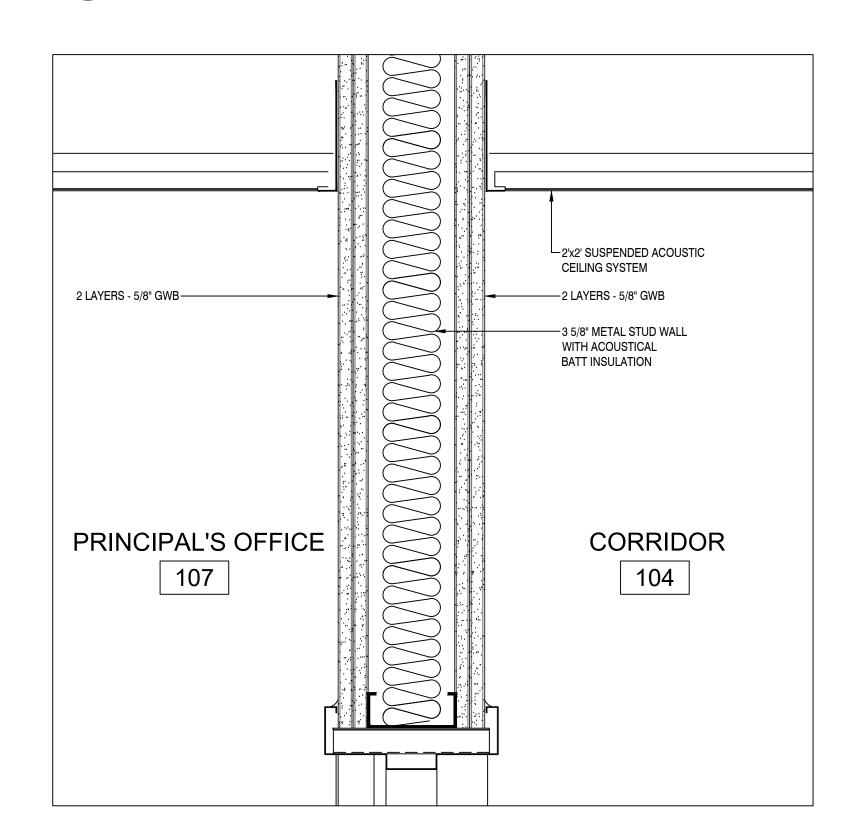
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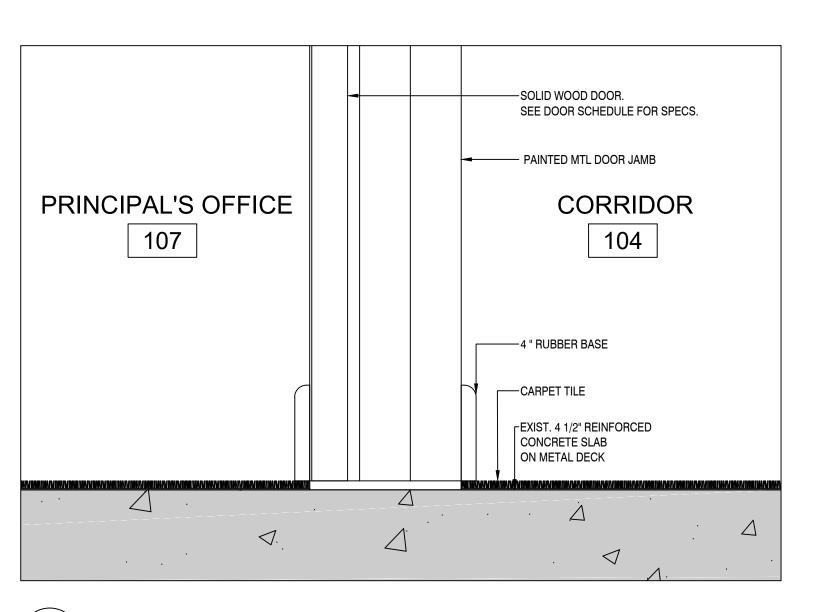
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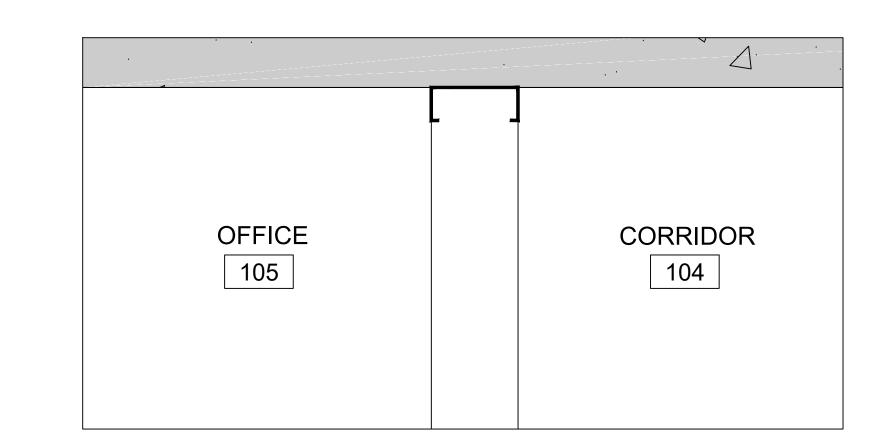
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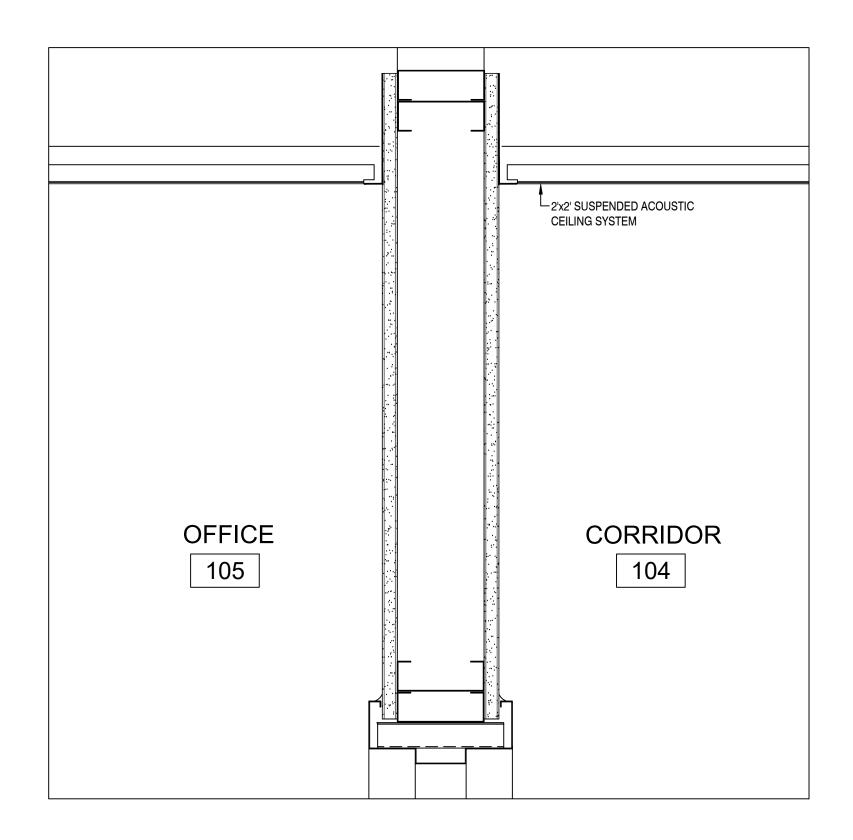
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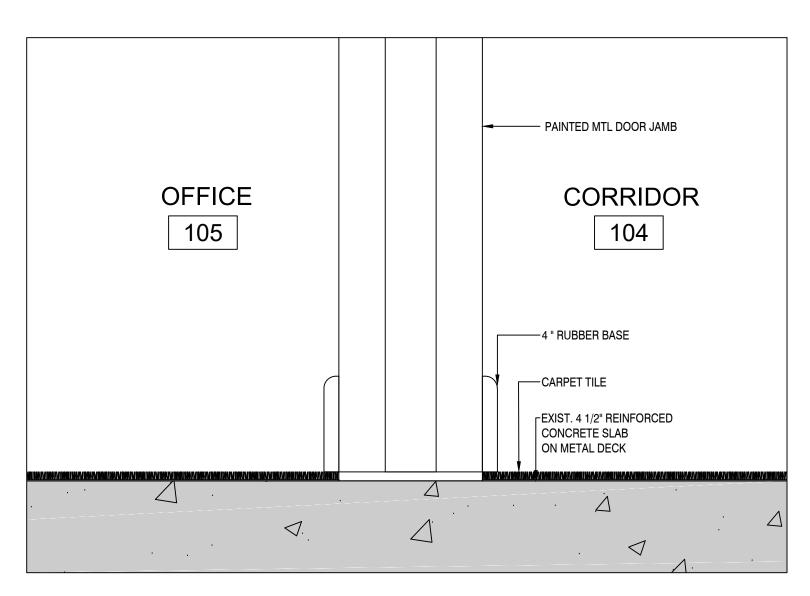
PARTIAL SECTION DETAIL



PARTIAL SECTION DETAIL



PARTIAL SECTION DETAIL



PARTIAL SECTION DETAIL



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CONSULTANTS

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CLIENT



TOWN OF ARLINGTON FACILITIES DEPARTMENT 869 MASSACHUSETTS AVE ARLINGTON, MA, 02476 781-316-3110

PROJECT

JOHN A. BISHOP ELEMENTARY SCHOOL OFFICE RENOVATION PROJECT 25 COLUMBIA RD ARLINGTON, MA, 02474

REVISIONS

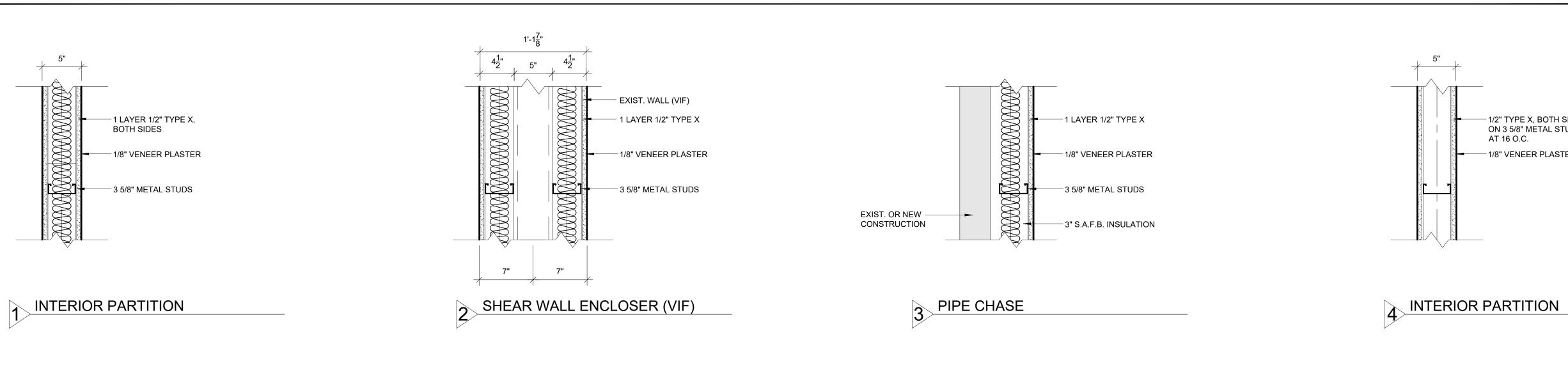
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CONSTRUCTION **DOCUMENTS**

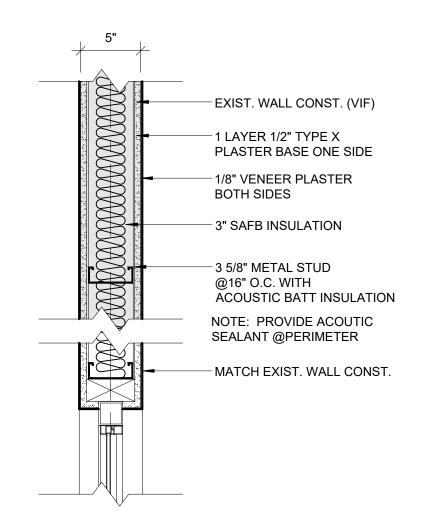
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DRAWN BY:	AOHA
DATE:	25 MAY 2023
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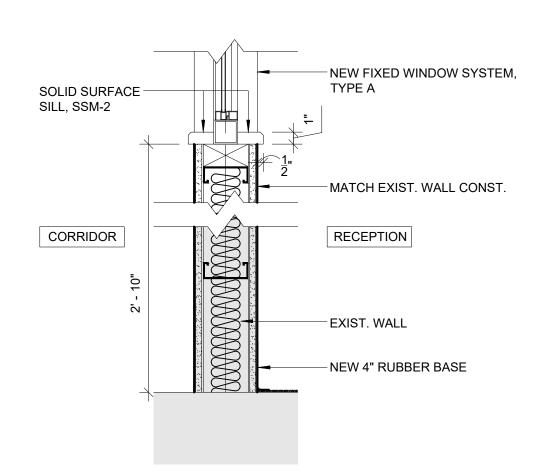
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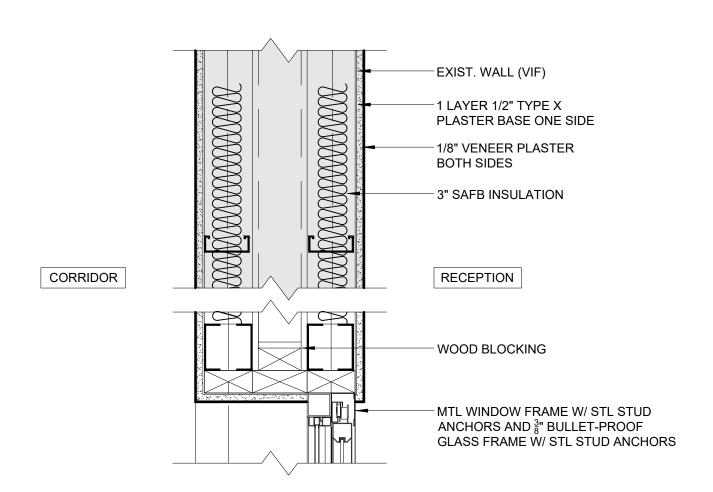




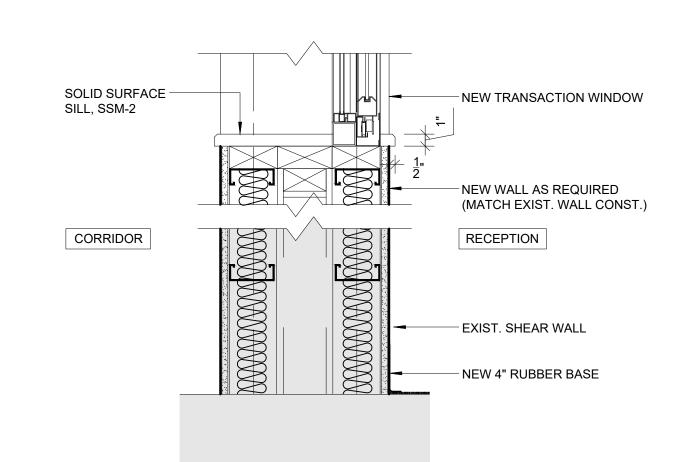




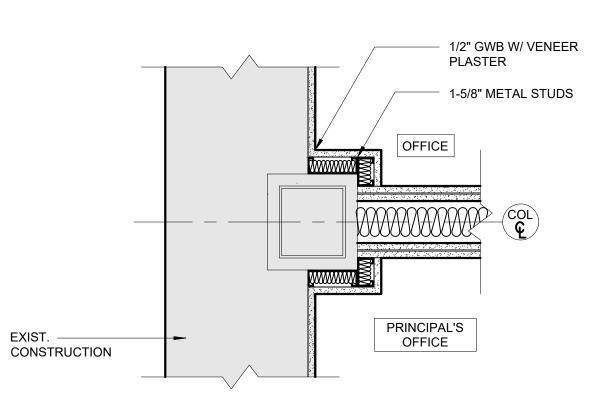
5 SILL AT NEW WINDOW, TYPE A







6 SILL AT NEW WINDOW, TYPE B



4 DETAIL AT COLUMN

3/4" = 1'-0"



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CONSULTANTS

1/2" TYPE X, BOTH SIDES

ON 3 5/8" METAL STUDS,

- 1/8" VENEER PLASTER

AT 16 O.C.

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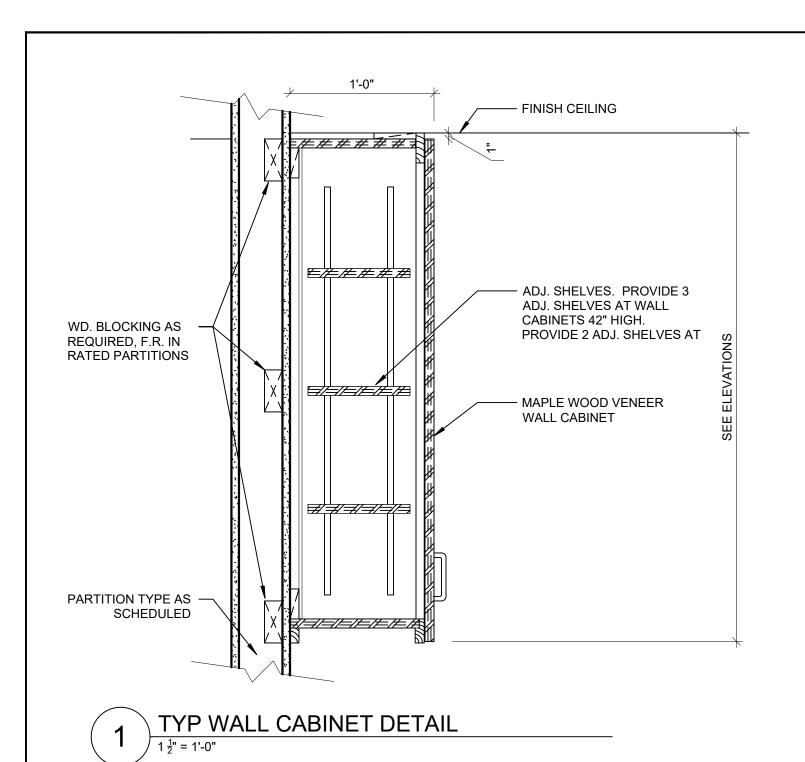
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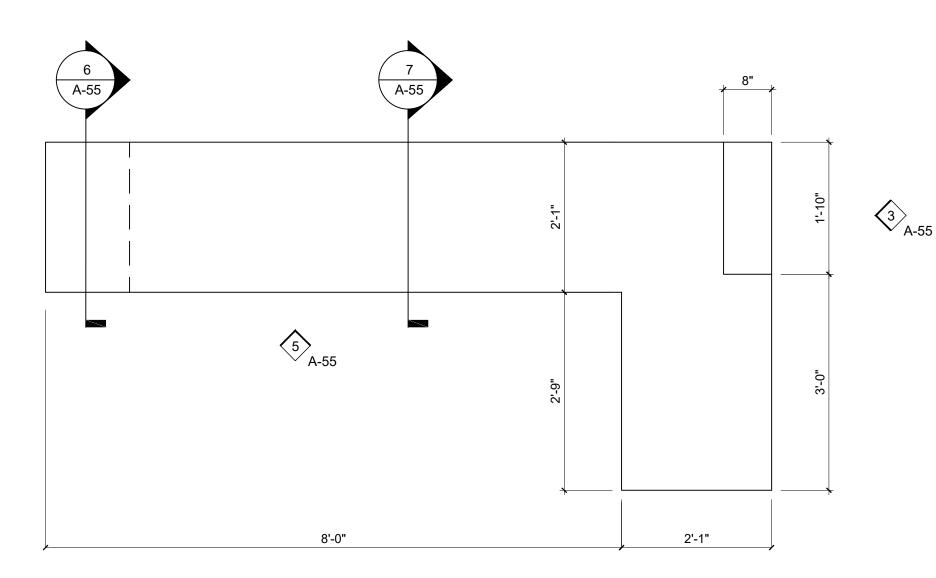
CONSTRUCTION **DOCUMENTS**

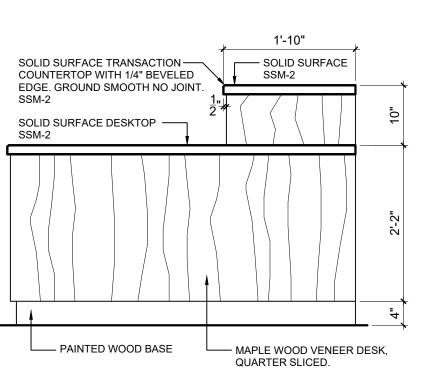
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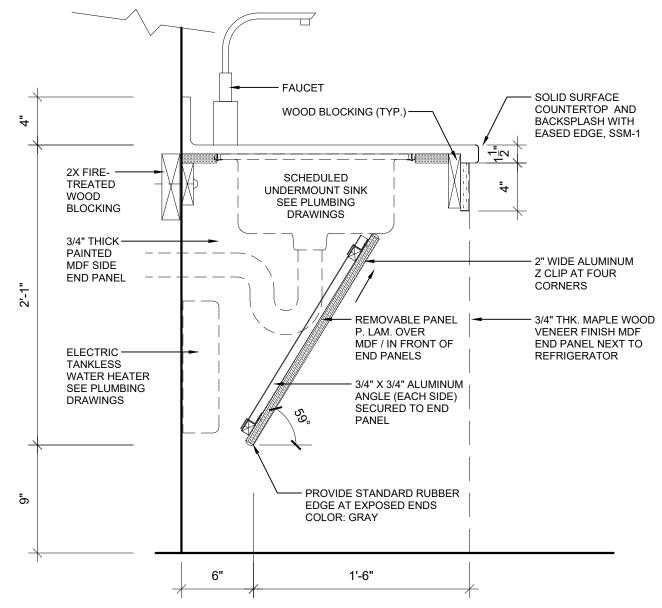




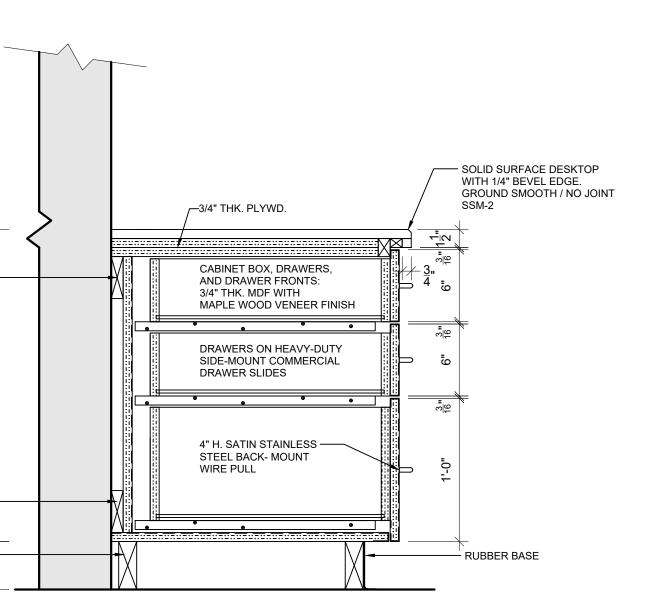


2 ENLARGED PLAN - RECEPTION DESK

3 RECEPTION DESK - SIDE ELEVATION
3/4" = 1'-0"







6 RECEPTION DESK - SIDE ELEVATION

1X CONT.

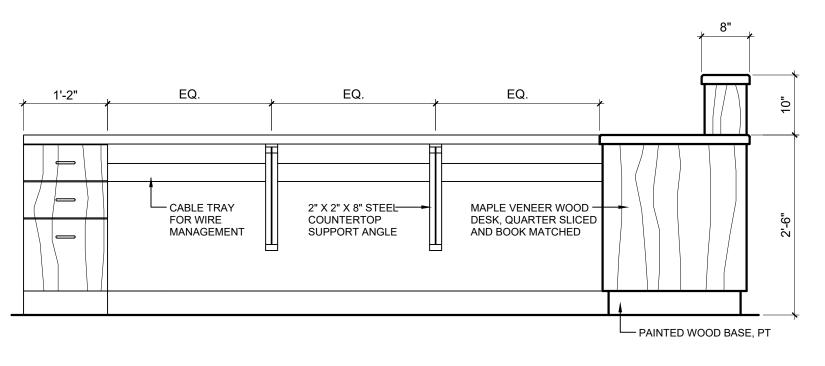
BLOCKING

1X CONT.

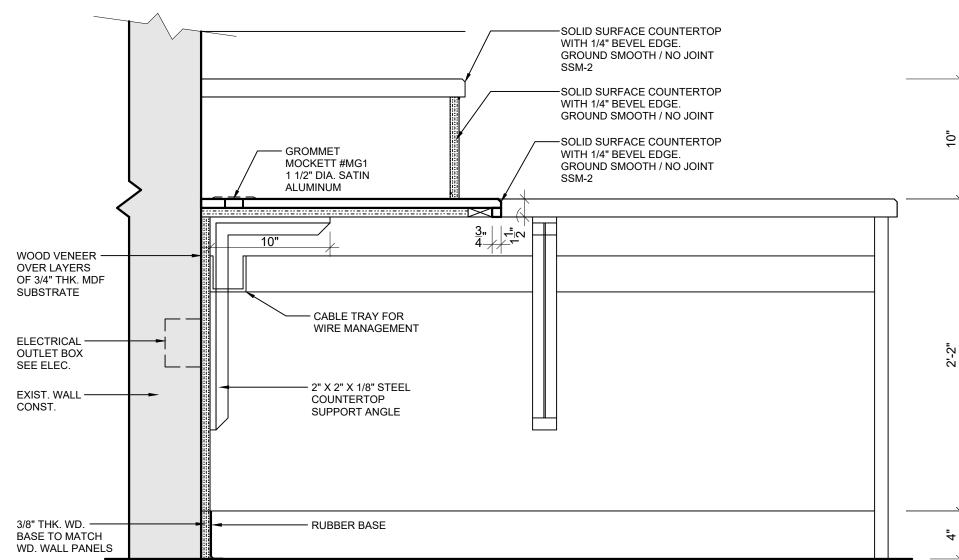
BLOCKING

2X CONT.

WOOD BLOCKING



8 RECEPTION DESK - FRONT ELEVATION



7 RECEPTION DESK - SECTION

1 ½" = 1'-0"



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CODE CONSULTANT:

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CLIENT



TOWN OF ARLINGTON
FACILITIES DEPARTMENT
869 MASSACHUSETTS AVE
ARLINGTON, MA, 02476
781-316-3110

PROJECT

JOHN A. BISHOP ELEMENTARY SCHOOL OFFICE RENOVATION PROJECT 25 COLUMBIA RD ARLINGTON, MA, 02474

REVISIONS

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SHEET TITLE

Millwork

SPRINKLER GENERAL NOTES

- DRAWINGS ARE DIAGRAMMATIC IN NATURE. THEY ARE NOT INTENDED TO BE ABSOLUTELY PRECISE; THEY ARE NOT INTENDED TO SPECIFY OR TO SHOW EVERY OFFSET, FITTING AND COMPONENT. THE PURPOSE OF THE DRAWINGS IS TO INDICATE A SYSTEM CONCEPT, THE MAIN COMPONENTS OF THE SYSTEMS AND THE APPROXIMATE GEOMETRIC RELATIONSHIPS. BASED UPON THE SYSTEMS CONCEPT, THE MAIN COMPONENTS, AND THE APPROXIMATE GEOMETRIC RELATIONSHIPS, PROVIDE ALL OTHER COMPONENTS AND MATERIALS NECESSARY TO MAKE THE SYSTEMS FULLY COMPLETE AND OPERATIONAL.
- MAKE REASONABLE AND NECESSARY MODIFICATIONS IN LAYOUTS AND COMPONENTS NEEDED TO PREVENT CONFLICT WITH WORK OF OTHER TRADES AND TO COORDINATE IN ACCORDANCE WITH SPECIFICATIONS
- MAINTAIN MAXIMUM HEADROOM AT ALL LOCATIONS. ALL PIPING TO BE AS TIGHT TO UNDERSIDE OF DECK AS POSSIBLE. ALL EXPOSED PIPING SHALL BE APPROVED BY ENGINEER AND SHALL MAINTAIN REQUIRED CLEARANCES.
- 4. SYSTEMS SHALL RUN IN A RECTILINEAR FASHION.
- MAINTAIN COMPLETE AND SEPERATE SET OF INSTALLATION DRAWINGS ON SITE AT ALL TIMES. RECORD WORK COMPLETED AND ALL MODIFICATIONS CLEARLY AND ACCURATELY.
- 6. ALL SYSTEM COMPONENTS SHALL BE UL-LISTED IN ACCORDANCE WITH NFPA REQUIREMENT, AND SHALL BE INSTALLED IN ACCORDANCE WITH LISTING REQUIREMENTS.
- THREADED ROD SHALL NOT BE FORMED OR BENT. ALL BOWED, BENT OR OTHERWISE DEFORMED THREADED ROD SHALL BE REPLACED WITH NEW.
- 8. PROVIDE SUPERVISION AT ALL VALVES.
- 9. PROVIDE SIGNAGE AT ALL CONTROL VALVES, DRAIN VALVES AND TEST CONNECTIONS INDICATING VALVE FUNCTION AND PORTION OF SYSTEM CONTROLLED.
- 10. PROVIDE FIREPROOF THROUGH PENETRATION ASSEMBLIES AT ALL PENETRATIONS OF SMOKE AND/OR FIRE RATED FLOORS AND WALLS IN ACCORDANCE WITH BUILDING CODE AND SPECFICATION REQUIREMENTS
- 11. SPRINKLERS SHALL BE PROVIDED THROUGHOUT.
- 12. PROVIDE ADDITIONAL SPRINKLERS BEYOND CODE REQUIRED MINIMUMS TO PROVIDE SYMMETRICAL LAYOUTS.
- 13. ALL UPRIGHT SPRINKLERS SHALL BE INSTALLED IN WITH 1" RISER NIPPLES.
- 14. ALL PIPING SHALL BE ARRANGED TO DRAIN BACK TO CONTROL VALVE ASSEMBLY. WHERE PIPING CANNOT DRAIN BACK TO CONTROL VALVE ASSEMBLY, PROVIDE ADDITIONAL DRAIN CONNECTIONS IN ACCORDANCE WITH NFPA 13 REQUIREMENTS.
- 15. ALL FIRE DEPARTMENT VALVES SHALL BE 2½" PRESSURE REDUCING TYPE, WITH 1½" REDUCER CAP AND CHAIN

MASSACHUSETTS THREE TIER PROCESS

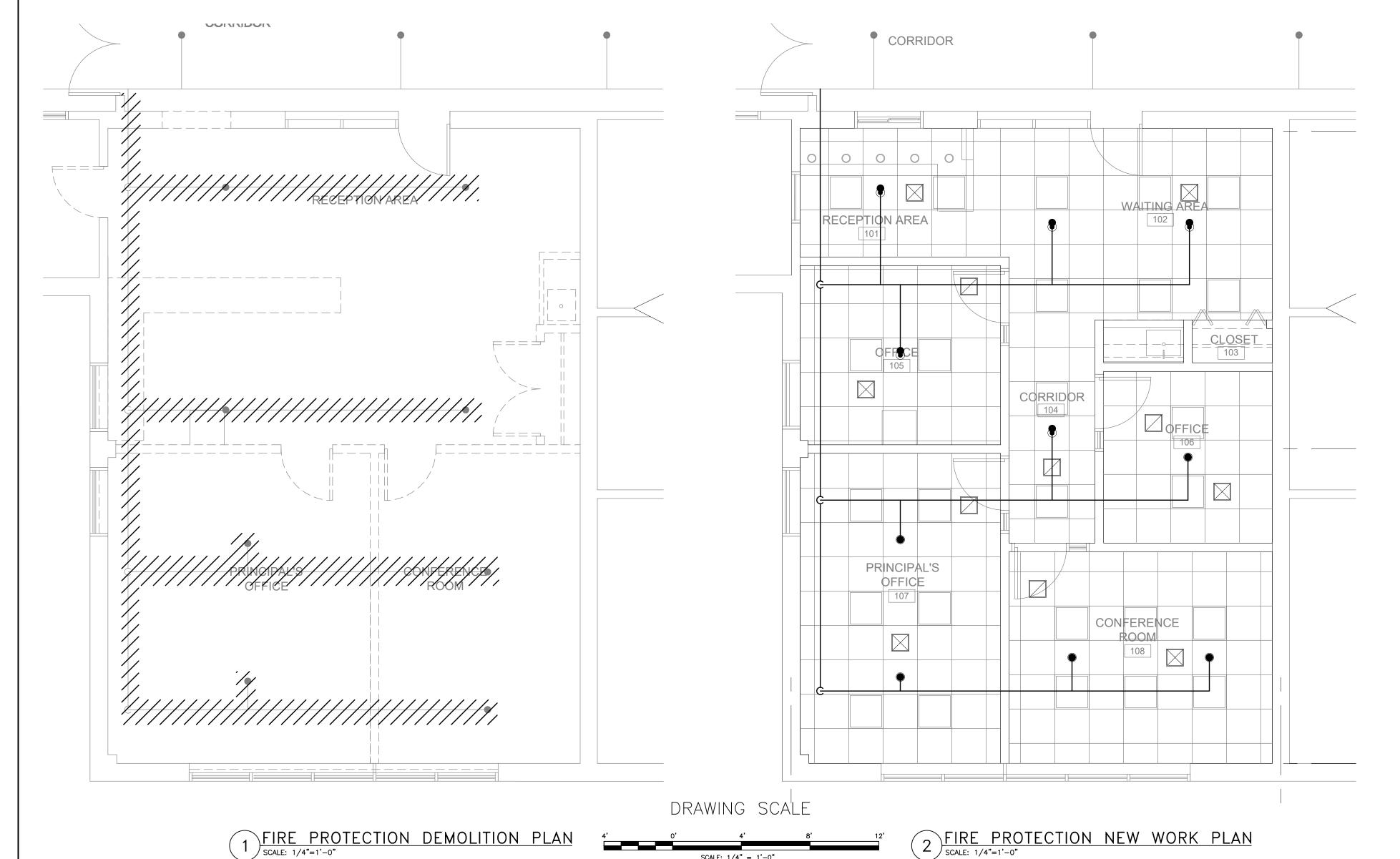
- THIS PROJECT SHALL BE DESIGNED AND CONSTRUCTED UNDER THE THREE TIER SYSTEM, PER THE MASSACHUSETTS BUILDING CODE, 780 CMR, CHAPTER 9. A. TIER ONE, CONSTRUCTION DOCUMENTS
 - 1. PRIOR TO ISSUANCE OF A BUILDING PERMIT, CONSTRUCTION DOCUMENTS FOR THE FIRE PROTECTION SYSTEM MUST BE SUBMITTED AND A BUILDING PERMIT OBTAINED PRIOR TO THE INSTALLATION OF FIRE PROTECTION SYSTEMS OR MODIFICATIONS, ALTERATIONS, ADDITIONS OR DELETIONS TO AN EXISTING FIRE PROTECTION SYSTEM.
 - 2. THE CONSTRUCTION DOCUMENTS SHALL CONTAIN CONFORM TO ALL REQUIREMENTS LISTED IN THE BUILDING CODE.
- B. TIER TWO. SHOP DRAWINGS
- 1. PRIOR TO INSTALLATION OF FIRE PROTECTION SYSTEMS, SHOP DRAWINGS AND HYDRAULIC CALCULATIONS SHALL BE PREPARED BY THE CONTRACTOR.
- 2. DRAWINGS AND HYDRAULIC CALCULATIONS SHALL CONFORM TO ALL REQUIREMENTS LISTED IN THE BUILDING CODE. THE SHOP DRAWINGS AND HYDRAULIC CALCULATIONS SHALL THEN BE SUBMITTED TO THE ENGINEER OF RECORD. WHEN THE ENGINEER OF RECORD IS SATISFIED WITH THE DRAWINGS AND HYDRAULIC CALCULATIONS, THEY WILL BE SEALED.
- 3. THE CONTRACTOR SHALL THEN SUBMIT DRAWINGS AND HYDRAULIC CALCULATIONS TO THE BUILDING OFFICIAL AND FIRE OFFICIAL, AND OBTAIN
- C. TIER THREE, RECORD DRAWINGS
- 1. AS BUILT PLANS SHALL BE PROVIDED TO THE BUILDING OWNER FOR ALL FIRE PROTECTION AND LIFE SAFETY SYSTEMS THAT ARE SEALED AS REVIEWED AND APPROVED BY THE ENGINEER OF RECORD, PERFORMING CONSTRUCTION CONTROL.
- 2. SHOP DRAWINGS SHALL BE MODIFIED AS NECESSARY, WITH ANY FIELD CHANGES IDENTIFIED BY CLOUDS ON THE DRAWINGS.
- 3. WHEN THE ENGINEER OF RECORD IS SATISFIED WITH THE DRAWINGS AND HYDRAULIC CALCULATIONS, THEY WILL BE SEALED. THESE COMPLETED DOCUMENTS WILL THEN BE INCORPORATED INTO THE OPERATION & MAINTENANCE MANUALS, AND DELIVERED TO THE OWNER.

SPRINKLER SYSTEM DESIGN CRITERIA									
OCCUPANCY		REMOTE AREA (SQUARE FEET)	`	MAXIMUM AREA PER HEAD (SQ. FT.)	INTERIOR HOSE STREAM	SYSTEM TYPE	NOTES		
UBLIC SPACES, LOBBIES, ORRIDORS, OFFICES AND RESIDENTIAL UNITS.		1500	.10	225	100	WET	USE QUICK RESPONSE SPRINKLERS.		

ADDITIONAL REQUIREMENTS:

1. CONTRACTOR TO OBTAIN CURRENT WATER INFORMATION FROM UTILITY COMPANY WITHIN SIX MONTHS OF PERMIT. 2. CONTRACTOR TO COORDINATE WITH ARCHITECT FOR QUANTITY AND LOCATION OF ALL FIRE EXTINGUISHER CABINETS.

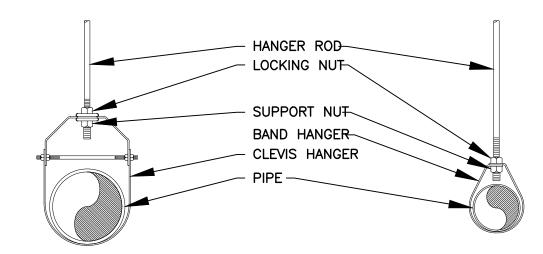
SPRINKLER SCHEDULE										
SYMBOL	<u>TYPE</u>	<u>FINISH</u>	<u>MAKE</u>	MODEL	SIZE	<u>K</u>	<u>REMARKS</u>			
•	RECESSED PENDENT	BRONZE	VIKING	VK462	½"	5.6	LOCATED AS INDICATED ON PLANS			



SCALE: 1/4" = 1'-0"

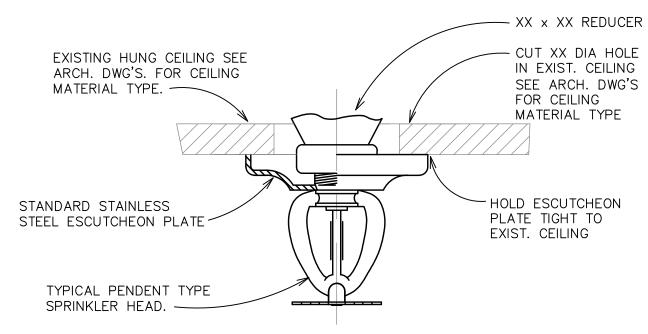
FIRE PROTECTION SYSTEM INTENT

- ALL WORK SHALL BE INSTALLED IN CONFORMANCE WITH NFPA 13. & 14.
- PERFORM A NEW FLOW TEST AND USE THE RESULTS WHEN PREPARING HYDRAULIC CALCULATIONS.
- PREPARE SHOP DRAWINGS AND HYDRAULIC CALCULATIONS AS PRESCRIBED BY NFPA 13. SHOP DRAWINGS AND HYDRAULIC CALCULATIONS SHALL BE SEALED BY AN ENGINEER REGISTERED IN MASSACHUSETTS.
- SHOP DRAWINGS AND HYDRAULIC CALCULATIONS SHALL BE SUBMITTED BY A STATE LICENSED CONTRACTOR AND A PERMIT OBTAINED FROM THE BOSTON FIRE DEPARTMENT PRIOR TO THE COMMENCEMENT OF WORK.
- PROVIDE A NEW WATER SERVICE ENTRANCE, CONNECTED TO THE SITE SYSTEM 10'-0" FROM THE BUILDING. PROVIDE A BACKLFLOW PREVENTER, WET ALARM VALVE ASSEMBLY, AND A FIRE DEPARTMENT INLET CONNECTION.
- PROVIDE A COMPLETE WET SPRINKLER SYSTEM, IN ACCORDANCE WITH NFPA 13.
- PROVIDE A COMPLETE COMBINED RISER SYSTEM IN ACCORDANCE WITH NFPA 14.

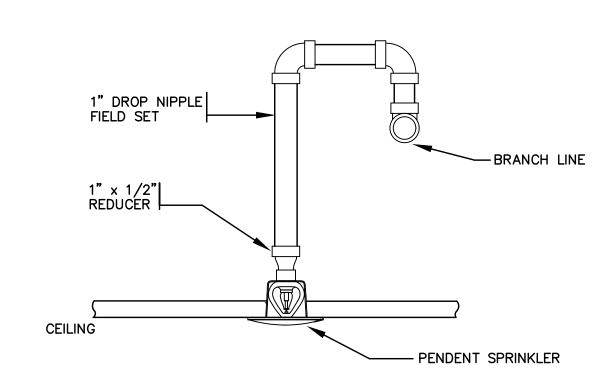


3 INCH AN	D LARGER	2-	-1/2" AND SMALLER						
HANGER ROD	SCHEDULE	H/	HANGER ROD SPACING						
PIPE SIZE	ROD SIZE	PIPE SIZI	E MAX. ALLOWABLE SPACING						
UP TO 2"	3/8" DIA.	1"	7'						
2-1/2" THRU 3"	1/2" DIA.	1-1/4"	8'						
4" AND 5"	5/8" DIA.	1-1/2"	9'						
		2"	10'						
		2-1/2"	11'						
		3" THRU	81 121						

3 SPRINKLER PIPE HANGER INSTALLATIOND DETAIL
SCALE: NTS



4 PENDANT SPRINKLER HEAD DETAIL SCALE: NTS



5 SPRINKLER HEAD BEND AND DROP DETAIL
SCALE: NTS



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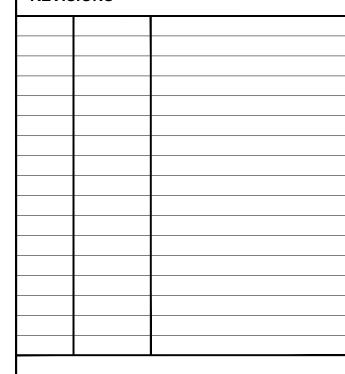


TOWN OF ARLINGTON FACILITIES DEPARTMENT 869 MASSACHUSETTS AVE ARLINGTON, MA, 02476 781-316-3110

PROJECT

JOHN A. BISHOP ELEMENTARY SCHOOL OFFICE RENOVATION PROJECT 25 COLUMBIA RD ARLINGTON, MA, 02474

REVISIONS



CONSTRUCTION **DOCUMENTS**

PROJECT NO:	228.00
DRAWN BY:	BCO
DATE:	25 MAY 2023
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SHEET TITLE

Fire Protection Demolition and New Work Plans

FP-1.0

GENERAL PROJECT NOTES

- I. GENERAL NOTES, SYMBOLS LIST AND DETAILS ARE APPLICABLE TO ALL DRAWINGS MARKED P
- 2. DRAWINGS ARE DIAGRAMMATIC: DETERMINE LOCATIONS OF SYSTEMS AND COMPONENTS IN
- 3. DETERMINE EXACT LOCATIONS OF EXISTING
 UTILITIES IN FIELD, WETHER OR NOT SHOWN ON
 DRAWINGS. EXERCISE CAUTION AND IDENTIFY
 LOCATIONS OF UNMARKED UTILITY LINES AS
 NECESSARY TO PERFORM WORK OF THIS SECTION.
- 4. ALL PLUMBING WORK SHOWN SHALL BE IN ACCORDANCE WITH THE LATEST PLUMBING CODE AND ALL APPLICABLE LOCAL CODES.
- 5. IT SHALL BE THE RESPONSIBILITY OF THIS CONTRACTOR TO COORDINATE THE WORK WITH THAT OF ALL OTHER TRADES, INCLUDING BUT NOT LIMITED TO, ELECTRICAL, HVAC, SPRINKLER, PLUMBING STRUCTURAL AND GENERAL ARCHITECTURE.
- 6. ANY INTERFERENCE SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER'S REPRESENTATIVE, AND SHALL BE RESOLVED PRIOR TO THE INSTALLATION OF THE WORK.
- 7. NO WORK SHALL BE INSTALLED IN VIOLATION OF ANY GOVERNING CODES. ANY WORK SHOWN ON THE DRAWINGS WHICH IS IN VIOLATION OF SUCH CODES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER AND SHALL BE RESOLVED PRIOR TO THE INSTALLATION OF THE WORK.
- 8. ALL PIPING PENETRATING EXTERIOR WALLS AND ROOFS SHALL BE FLASHED IN AN APPROVED PULTE MANNER AND SHALL BE SEALED WEATHERTIGHT. PIPING PENETRATING FIRE RATED PARTITIONS SHALL BE PROVIDED WITH FIRE RATED SEALS AS REQUIRED BY LOCAL CODE AUTHORITY.
- 9. MANUFACTURERS' MODEL NUMBERS ARE SPECIFIED SOLELY TO ESTABLISH STANDARDS OF QUALITY FOR PERFORMANCE AND MATERIALS.
- 10. INSTALLATION SHALL ADHERE TO MANUFACTURERS' RECOMMENDATIONS.

11. PROVIDE AND INSTALL ACCESS PANELS TO SYSTEM COMPONENTS THAT ARE CONCEALED AND REQUIRE

12. PROVIDE CLAMPS, OFFSETS, EXPANSION JOINTS,

ANCHORS AND GUIDES AS NECESSARY TO

13. PITCH PRESSURE PIPING IN DIRECTION OF FLOW.

ELEVATIONS PRIOR TO RUNNING ANY PIPING.

REFER TO DRAWINGS FOR LOCATIONS OF ALL

15. PROVIDE THERMOSTATIC MIXING VALVE IN DOMESTIC

COLD WATER AND DOMESTIC HOT WATER PIPING

14. VERIFY EXACT SIZES, LOCATIONS, INVERTS AND

16. ALL NEW AND EXISTING ACCESSIBLE DOMESTIC

17. INSTALL AT PLUMBING SYSTEMS IN ACCORDANCE

MASSACHUSETTS STATE BUILDING CODE WITH

18. ALL FIXTURES AND EQUIPMENT USED SHALL BE

MA STATE PLUMBING BOARD APPROVED AND

ASSOCIATED APPROVAL NUMBER FOR REVIEW.

19. "FURNISH" SHALL BE DEFINED AS TO SUPPLY AND

UNLOADING, UNPACKING, ASSEMBLY, INSTALLATION

AND SIMILAR OPERATIONS. "INSTALL" SHALL BE

DEFINED AS WORK WHICH INCLUDES THE ACTUAL

UNLOADING, UNPACKING, ASSEMBLY, INSTALLATION

DEFINED AS TO FURNISH AND INSTALL, COMPLETE

SHALL BE DEFINED AS TO BE ALL INCLUSIVE OF

AND SIMILAR OPERATIONS. "PROVIDE" SHALL BE

AND READY FOR THE INTENDED USE. "WIRING"

RACEWAYS, CONDUCTORS, JUNCTION BOXES,

SAFETY SWITCHES AND MAKING FINAL

DELIVER TO THE PROJECT SITE, READ FOR

SHALL BE SUBMITTED TO ENGINEER WITH

AMENDMENTS, MASSACHUSETTS STATE PLUMBING

CODE AND ALL LOCAL AND STATE REQUIREMENTS

AND SHALL COORDINATE WITH ALL AUTHORITIES

WITH THE PROJECT SPECIFICATION,

PERIODIC SERVICE.

PREVENT STRESS ON PIPING.

FIXTURES AND EQUIPMENT.

HOT WATER SUPPLY.

SHALL BE INSULATED.

HAVING JURISDICTION.

CONNECTIONS.

	PIPE (ABOVE GRADE)
	PIPE (BELOW GRADE)
	COLD WATER PIPING
	HOT WATER PIPING
	HOT WATER RECIRC PIPING
G	NATURAL GAS PIPING
	SANITARY PIPING

————— VENT PIPING

PIPE LINETYPES

GENERAL SYMBOLS

GENERAL STW	DULS
CONNECT TO EXISTING	
ADDENDUM DATUM MARKER	1
DEMOLITION CALL OUT HATCH	///////
BALL VALVE	L
	ADDENDUM DATUM MARKER DEMOLITION CALL OUT HATCH

PIPING SCHEDULE

PIPE TYPE TAG	DESCRIPTION		PIPE INFO	ORMATION		INSUL			
		SIZE (IN)	PIPE MATERIAL	FITTINGS TYPE	FITTINGS MATERIAL	TYPE	COVER	THICKNESS (IN)	REMARKS
CW	DOMESTIC COLD WATER	0.5 - 3.0	TYPE L COPPER	SWEAT OR PRO PRESS	COPPER OR CAST BRASS	ASJ SSL FIBERGLASS	PVC	0.5	1,3,4,5,6,7,8
DHW	DOMESTIC HOT WATER	0.5 - 3.0	TYPE L COPPER	SWEAT OR PRO PRESS	COPPER OR CAST BRASS	ASJ SSL FIBERGLASS	PVC	0.5	1,2,3,4,5,6,7,8

REMARKS:

- . PROVIDE FITTINGS RATED FOR 250 PSI WORKING PRESSURE ON ALL PUMP APPLICATIONS
- PIPING TO UTILIZE EXPANSION JOINTS AS REQUIRED
 PROVIDE FACTORY FORMED FIBERGLASS FITTING COVERS OR MITERED JOINTS WITH SEALED ENDS.
- 4. PROVIDE FACTORY FORMED PVC COVERS ON ALL FITTINGS
 5. PROVIDE PVC COVERS ON ALL EXPOSED PIPING THROUGHOUT
- 6. PROVIDE TYPE ASJ SSL FIBERGLASS PIPE INSULATION WITH INTEGRAL VAPOR BARRIER.
- 7. PIPING SHALL BE LABELED INDICATING PIPE USAGE USING ADHESIVE TYPE LABELS WITH WHITE BACKGROUND AND BLACK LETTERING.
 8. PIPING SHALL BE LABELED INDICATING PIPE FLOW DIRECTION USING ADHESIVE TYPE LABELS WITH WHITE BACKGROUND AND BLACK ARROWS.



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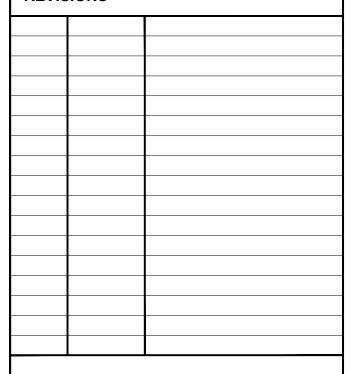


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PROJECT

JOHN A. BISHOP ELEMENTARY SCHOOL OFFICE RENOVATION PROJECT 25 COLUMBIA RD ARLINGTON, MA, 02474

REVISIONS



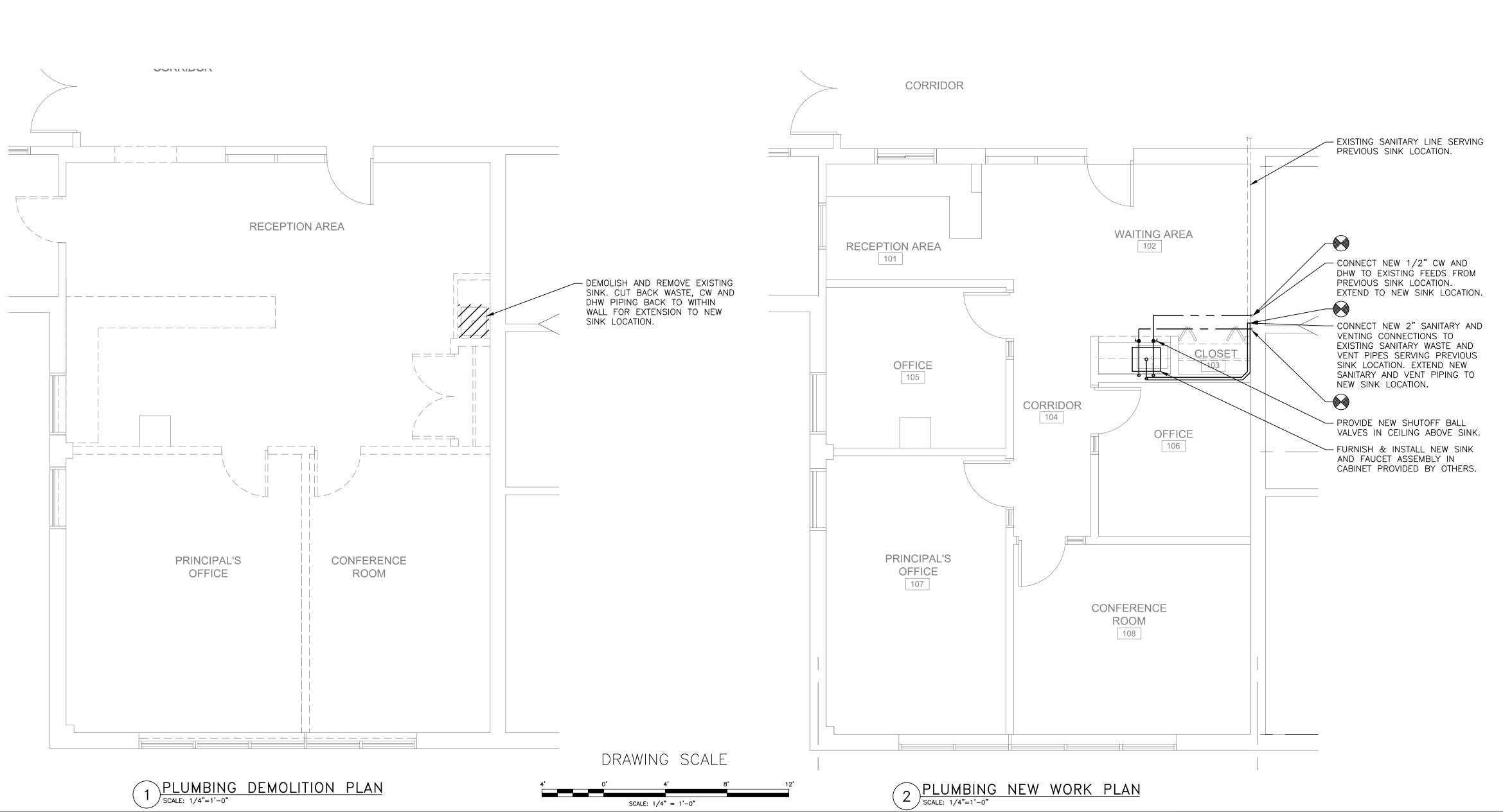
CONSTRUCTION DOCUMENTS

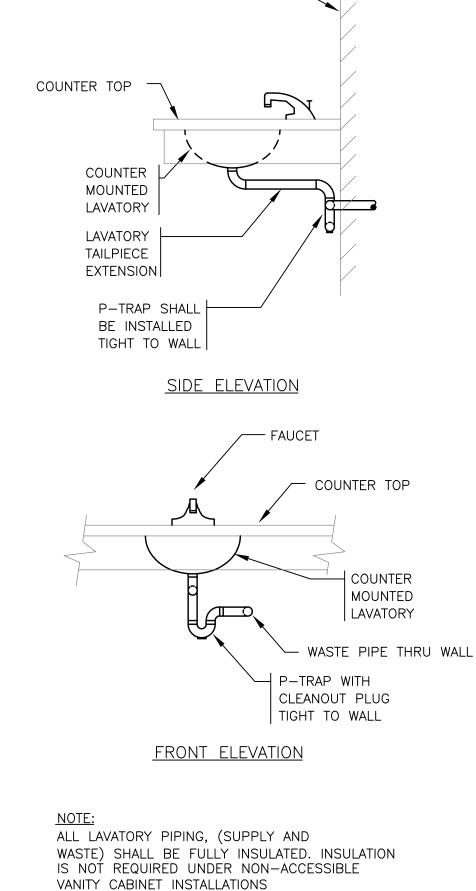
PROJECT NO:	228.00
DRAWN BY:	ВСО
DATE:	25 MAY 2023
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SHEET TITLE

Plumbing Demolition and New Work Plans

P-1.0





3 SINK DETAIL
SCALE: NTS

FINISH WALL

GENERAL NOTES

ABBREVIATIONS

ASJ

AVG

BDD

BHP

BMS

BTU

CFM

CKT

CO

CUF

CS

DN

DWG

EFF

ESP

ETR

EXH

EXP

FD

FSD

FPM

DEGREES FAHRENHEIT

ABOVE FINISHED FLOOR

BOILER CONTROL SYSTEM

ALL SERVICE JACKET

BACK DRAFT DAMPER

BRAKE HORSEPOWER

CARBON DIOXIDE

CIRCUIT BREAKER

CARBON MONOXIDE

CIRCUIT

CUBIC FEET

DIAMETER

DRAWING

EXHAUST FAN

EFFICIENCY

EXHAUST

EXPANSION

FREE AREA

FT/SEC FEET PER SECOND

FIRE DAMPER

DOWN

CIRCUIT SETTER

BELOW FINISHED FLOOR

BRITISH THERMAL UNIT

CUBIC FEET PER MINUTE

ENTERING AIR TEMPERATURE

EXTERNAL STATIC PRESSURE

ENTERING WATER TEMPERATURE

EXISTING TO REMAIN

FIRE SMOKE DAMPER FEET PER MINUTE

BUILDING MANAGEMENT SYSTEM

BRITISH THERMAL UNIT PER HOUR

AUTHORITY HAVING JURISDICTION

DIAMETER

ADJUSTABLE

ALTERNATE

BLOW DOWN

AVERAGE

- 1. ACCURACY AND EXTEND OF UTILITIES SHOWN WITHIN DRAWINGS IS NOT GUARANTEED. CONTRACTOR SHALL DETERMINE EXACT LOCATIONS OF EXISTING UTILITIES IN FIELD, REGARDLESS OF BEING SHOWN ON DRAWINGS OR NOT. EXERCISE CAUTION AND IDENTIFY LOCATIONS OF UNMARKED UTILITY LINES AS NECESSARY TO PERFORM THE WORK OF THIS SECTION.
- 2. NOT ALL GENERAL NOTES, ABBREVIATIONS OR SYMBOLS MAY APPLY TO THIS PROJECT. THEIR INTENT IS TO SERVE AS A GUIDE TO INTERPRETING THE INTENT OF ALL M—SERIES DRAWINGS.
- 3. ALL MECHANICAL WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE, NATIONAL CODES AND THE AUTHORITIES HAVING JURISDICTION.
- 4. THE CONTRACTOR OF THIS DIVISION IS RESPONSIBLE FOR PROVIDING ALL LABOR, MATERIALS, AND EQUIPMENT NECESSARY TO COMPLETE THE ENTIRE PROJECT AS SHOWN IN THESE DIVISION DRAWINGS AND SPECIFICATIONS. OBTAIN AND PAY FOR ALL PERMITS, FEES, AND ANY MATERIALS REQUIRED BY LOCAL JURISDICTIONS FOR THE EXECUTION OF THE CONTRACT DOCUMENTS.
- 5. ALL MECHANICAL WORK IS INDICATED DIAGRAMMATICALLY. THE CONTRACTOR OF THIS DIVISION IS RESPONSIBLE FOR VERIFYING THE REQUIREMENTS FOR, AND EXACT LOCATIONS OF, THE MECHANICAL EQUIPMENT, DUCTWORK, PIPING AND SURROUNDING CONDITIONS PRIOR TO WORK COMMENCING. CONTRACTOR SHALL COORDINATE WORK WITH THAT OF OTHER DIVISIONS. EQUIPMENT, DUCTS, OR PIPES INTERFERING WITH OTHER INSTALLATIONS SHALL BE RELOCATED AS REQUIRED AT NO ADDITIONAL COST TO THE OWNER.
- 6. THE CONTRACTOR OF THIS DIVISION SHALL VERIFY ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. VERIFY AND PROVIDE DUCT TRANSITIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DIMENSIONS BEFORE FABRICATION.
- 7. SUPPORT ALL EQUIPMENT, AND PIPING FROM BUILDING STRUCTURE AND PROVIDE A VIBRATION FREE INSTALLATION. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
- 8. ALL MATERIALS AND EQUIPMENT SHALL BE NEW. RE—USE OF EXISTING EQUIPMENT OR MATERIALS SHALL ONLY BE ALLOWED WHERE EXPLICITLY INDICATED IN DRAWINGS OR SPECIFICATIONS.
- 9. CONTRACTOR OF THIS DIVISION IS RESPONSIBLE FOR COORDINATION AND SCHEDULING ACCESS TO ALL WORK AREAS WITH THE OWNER.
- 10. ALL ODORS AND FUMES AS A RESULT OF CONSTRUCTION MUST BE CONTROLLED IN A MANNER SO AS TO NOT DISRUPT THE NEIGHBORS, RESIDENTS, OCCUPANTS OR STAFF.
- 11. ALL EQUIPMENT FURNISHED BY THE CONTRACTOR OF THIS DIVISION SHALL BE AS SPECIFIED OR APPROVED EQUAL.
- 12. CONTRACTOR OF THIS DIVISION IS RESPONSIBLE FOR COORDINATING ANY SYSTEM SHUTDOWNS WITH THE OWNER. THE OWNER SHALL BE PROVIDED A MINIMUM OF 48 HOURS NOTICE.
- 13. DEMOLITION, REMOVAL, AND DISPOSAL OF ALL MECHANICAL ITEMS WITHIN THE SCOPE OF THESE M-SERIES DRAWINGS IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR OF THIS DIVISION.
- 14. THE TERMS: "MECHANICAL CONTRACTOR", "HVAC CONTRACTOR", OR "CONTRACTOR" WHEN REFERENCED IN THESE DRAWINGS OR SPECIFICATIONS REFERS SPECIFICALLY TO THE CONTRACTOR OF THIS DIVISION.
- 15. FOR QUALITY ASSURANCE, ALL EQUIPMENT SHALL BE UL LISTED AND APPROVED. CONTRACTOR SHALL ALSO PERFORM WORK IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CONTRACTOR ASSOCIATION (NECA) "STANDARD OF INSTALLATION".
- 16. "FURNISH" SHALL BE DEFINED AS TO SUPPLY AND DELIVER TO THE PROJECT SITE, READ FOR UNLOADING, UNPACKING, ASSEMBLY, INSTALLATION AND SIMILAR OPERATIONS. "INSTALL" SHALL BE DEFINED AS WORK WHICH INCLUDES THE ACTUAL UNLOADING, UNPACKING, ASSEMBLY, INSTALLATION AND SIMILAR OPERATIONS. "PROVIDE" SHALL BE DEFINED AS TO FURNISH AND INSTALL, COMPLETE AND READY FOR THE INTENDED USE. "WIRING" SHALL BE DEFINED AS TO BE ALL INCLUSIVE OF RACEWAYS, CONDUCTORS, JUNCTION BOXES, SAFETY SWITCHES AND MAKING FINAL CONNECTIONS.

GAS

GΑ

GAL

GC

GPM

HWR

HWS

IN

LB

LSD

LVG

MBH

MECH

MFR

MIN

GAUGE

GALLONS

GROUND

HEIGHT

HEAD

HOUR

HERTZ

INCHES

POUND

LEAVING

MAXIMUM

MECHANICAL

MINIMUM

MOUNTED

MANUFACTURER

MAKE UP WATER

NOT APPLICABLE

NOISE CRITERIA

NOT TO SCALE

OUTSIDE AIR ON CENTER

OUTSIDE DIAMETER OPEN ENDED DUCT

HEATING COIL

HORSEPOWER

HOT WATER

GENERAL CONTRACTOR

GALLONS PER HOUR

GALLONS PER MINUTE

GYPSUM WALL BOARD

HOT WATER RETURN

HOT WATER SUPPLY

LEAVING AIR TEMPERATURE

LOCAL HOUSING AUTHORITY

LEAVING WATER TEMPERATURE

MINIMUM CIRCUIT AMPERAGE

MOTORIZED DAMPER

ONE-THOUSAND BRITISH THERMAL UNITS

LOCAL SCHOOL DISTRICT

INSIDE DIAMETER

- 17. VERIFY ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. VERIFY AND PROVIDE DUCT TRANSITIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DIMENSIONS BEFORE FABRICATION.
- 18. SUPPORT ALL EQUIPMENT, PIPING, AND DUCTWORK FROM BUILDING STRUCTURE AND PROVIDE A VIBRATION FREE INSTALLATION. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
- 19. THERMOSTATS ARE TO BE REPLACED IN LOCATIONS AS INDICATED IN DRAWINGS. WHERE THERMOSTAT LOCATIONS ARE NOT EXPLICITLY INDICATED, THE CONTRACTOR SHALL INSTALL THERMOSTAT ON AN INTERIOR WALL IN THE SPACE SERVED BY THE ASSOCIATED EQUIPMENT.
- 20. FLEXIBLE DUCTWORK IS PERMITTED ONLY IN LENGTHS UP TO 5'-0" FOR FINAL POSITIONING OF REGISTERS, GRILLES AND DIFFUSERS LOCATED IN SUSPENDED CEILINGS ONLY. FLEXIBLE DUCTWORK SHALL BE INSTALLED PER SMACNA STANDARDS, PROPERLY SUPPORTED AND FULLY EXTENDED AS TO PREVENT SAGGING
- 21. WHERE DUCTWORK CROSSINGS OCCUR, THE CONTRACTOR OF THIS DIVISION SHALL PROVIDE ALL REQUIRED TRANSITIONS/OFFSETS TO ALLOW FOR A COMPLETE INSTALLATION OF THE SYSTEM.
- 22. ALL DUCTWORK SHALL BE RAN BETWEEN JOISTS WHENEVER POSSIBLE. WHEN CROSSING JOISTS, DUCTWORK SHALL BE SECURED TIGHTLY TO UNDERSIDE OF FLOOR JOIST.
- 23. PROVIDE ALL SUPPLY AND OUTSIDE AIR DUCT WITH FOIL FACED 1-1/2 LB DENSITY FIBERGLASS INSULATION WITH A MINIMUM RATING OF R-8. RETURN AIR DUCT RUNNING THROUGH UNCONDITIONED SPACES SHALL ALSO BE INSULATED.
- 24. ALL SUPPLY AIR DUCTWORK SHALL BE CONSTRUCTED OF GALVANIZED SHEET STEEL CONSTRUCTED TO SMACNA STANDARDS AND IS TO BE RATED FOR 2.0" PRESSURE CLASS.
- 25. INTERNAL AIR FLOW DIMENSIONS ARE SHOWN FOR DUCTS. CONTRACTOR SHALL INCREASE SIZE FOR LINER OR DOUBLE WALL DUCTWORK WHERE IT IS APPLICABLE.
- 26. PROVIDE FLEXIBLE CONNECTIONS ON ALL DUCTS CONNECTING TO FANS AND AIR HANDLING UNITS UNLESS INTERNALLY ISOLATED. ALL DUCTS SHALL BE GROUNDED ACROSS FLEXIBLE CONNECTION WITH FLEXIBLE COPPER GROUNDING STRAPS.
- 27. SHEET METAL FITTINGS ARE TO BE PROVIDED AS SHOWN. NO SUBSTITUTES/DEVIATIONS SHALL BE ALLOWED WITHOUT PRIOR CONSENT FROM THE ENGINEER.
- 28. REFER TO SPECIFICATIONS FOR DUCTWORK CONSTRUCTION, SEAL, AND LEAKAGE CLASSES.
- 29. PROVIDE AT LEAST THREE—ELBOW SWING FOR PIPE TAKE—OFFS TO TERMINAL EQUIPMENT AND RISERS.
- 30. NOT ALL ISOLATION VALVES IN PIPING SYSTEMS ARE SHOWN ON ALL PLANS (FOR CLARITY) BUT ARE REQUIRED AT ALL PIPE BRANCHES AND CONNECTIONS TO EQUIPMENT. REFER TO DETAIL SHEETS AND SCHEMATIC PIPE DIAGRAMS.
- 31. PITCH PIPING 1/8 INCH PER FT MINIMUM TO LOW AND HIGH POINTS. ALLOW FOR DRAINING AND VENTING RESPECTIVELY.
- 32. IF SOLDER JOINTS ARE USED: PROTECT FLOORS, WALLS, AND FURNISHINGS FROM
- 33. PROVIDE HANGERS, CLAMPS, OFFSETS, EXPANSION JOINTS, ANCHORS, AND GUIDES AS NECESSARY TO PREVENT STRESS ON PIPING.
- 34. ALL CONTROL WIRE AND CONDUIT SHALL RUN IN A CONCEALED AND SECURE MANNER AND SHALL COMPLY WITH NEC, AND DIVISION 16000 SPECIFICATIONS.

POUNDS PER CUBIC FOOT

POUNDS PER SQUARE INCH

REVOLUTIONS PER MINUTE

TYPICAL (APPLIES TO EACH INSTANCE)

POLYVINYL CHLORIDE

STATIC PRESSURE

VOLUME DAMPER

SPECIFICATIONS

SQUARE

VELOCITY

WITHOUT

WATER GAUGE

WITH

PRESSURE DROP

PHASE

PRESSURE

PD

RPM

VEL

VOLUME DAMPER	VD
FIRE DAMPER	— √ FD
SMOKE DAMPER	─ SD
SMOKE DAMPER	—— √ FSD
MOTORIZED DAMPER	—— MD
SUPPLY DUCT UP (ROUND AND RECTANGULAR)	
SUPPLY DUCT DOWN (ROUND AND RECTANGULAR)	
RETURN DUCT UP (ROUND AND RECTANGULAR)	
RETURN DUCT DOWN (ROUND AND RECTANGULAR)	
STANDARD RADIUS ELBOW (R = W)	T W
SHORT RADIUS ELBOW (R = W x 1/2)	₩ R
DUCT OFFSET UP OR DOWN (USING 45 DEGREE FITTINGS)	UP/DN
DUCT HORIZONTAL OFFSET	
DUCT EXPANSION/CONTRACTION	
BULL NOSE TEE (ROUND & RECTANGULAR)	
BRANCH TAKE OFF W/VOLUME DAMPER (ROUND & RECTANGULAR)	VD VD
DUCT MOUNTED REGISTER W/OPPOSED BLADE DAMPER	OBD
OPEN END DUCT W/WIRE MESH SCREEN	
SQUARE TO ROUND ADAPTER	
FLEXIBLE DUCTWORK	
DUCTWORK TO BE DEMOLISHED	
SUPPLY DIFFUSER/REGISTER (SEE TAG FOR DISTINCTION)	
RETURN GRILLE	-2
SUPPLY AIRFLOW ARROW	
RETURN AIRFLOW ARROW	
WALL MOUNTED THERMOSTAT	(T)

GENERAL DRAWING SYMBOLS	8
EQUIPMENT TAG (ELECTRICAL REQUIRED)	TAG DATA DATA
EQUIPMENT TAG (NO ELECTRICAL REQ.)	TAG DATA DATA
CONNECT TO EXISTING	
LIMIT OF DEMOLITION	
SECTION VIEW CALL OUT	1 H3.1
DETAIL CALL OUT	1 H3.1
ADDENDUM DATUM MARKER	1
DEMOLITION CALL OUT HATCH	11/1///
	,



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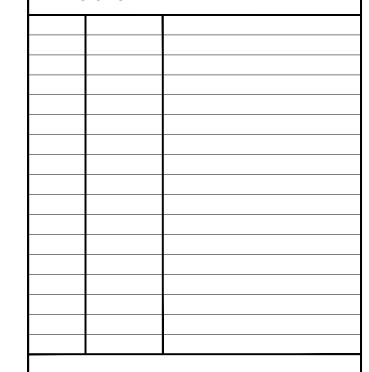


TOWN OF ARLINGTON FACILITIES DEPARTMENT 869 MASSACHUSETTS AVE ARLINGTON, MA, 02476 781-316-3110

PROJECT

JOHN A. BISHOP ELEMENTARY SCHOOL OFFICE RENOVATION PROJECT 25 COLUMBIA RD ARLINGTON, MA, 02474

REVISIONS



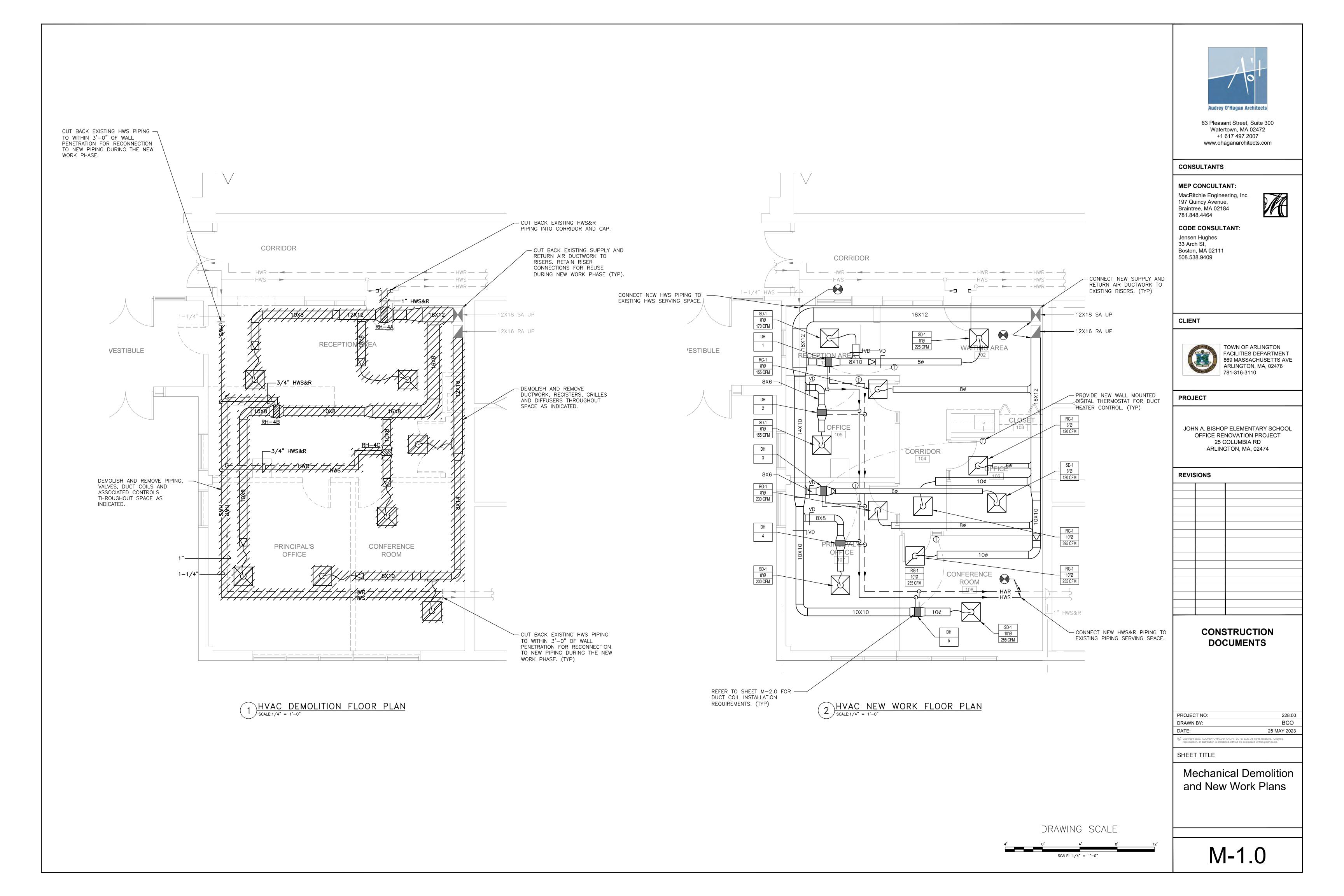
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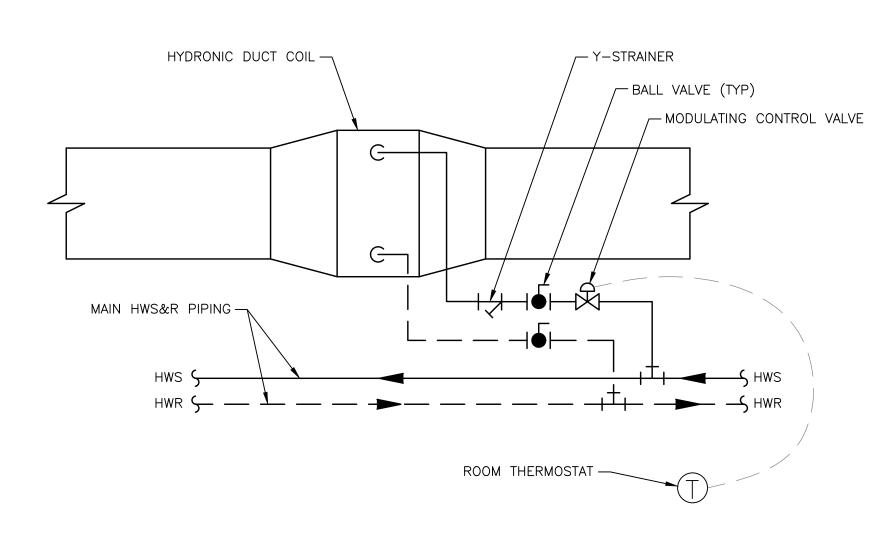
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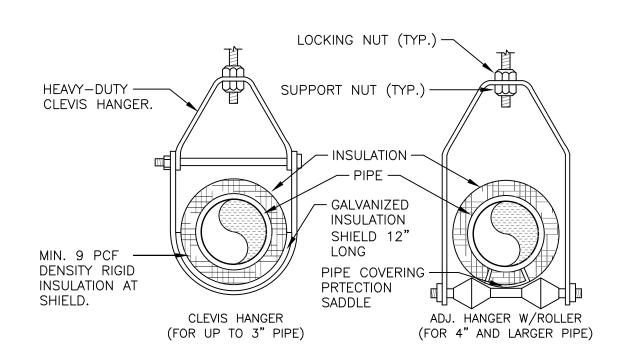
Mechanical Legend,
Notes, & Abbreviations

M-0.1



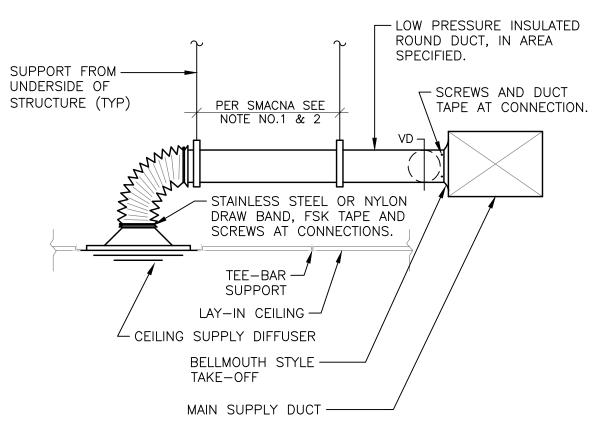


DUCT COIL PIPING DETAIL



NOTES: 1. SEE SPECIFICATION FOR HANGER SIZES. 2. PIPE 8" AND LARGER SHALL HAVE ROLLER SUPPORTED BY DUAL RODS. 3. FOR CHW SERVICE OVER 3", REPLACE SADDLE WITH 12" LONG 14 GA. SHIELD WITH RIGID INSULATION BETWEEN PIPE AND SHIELD.

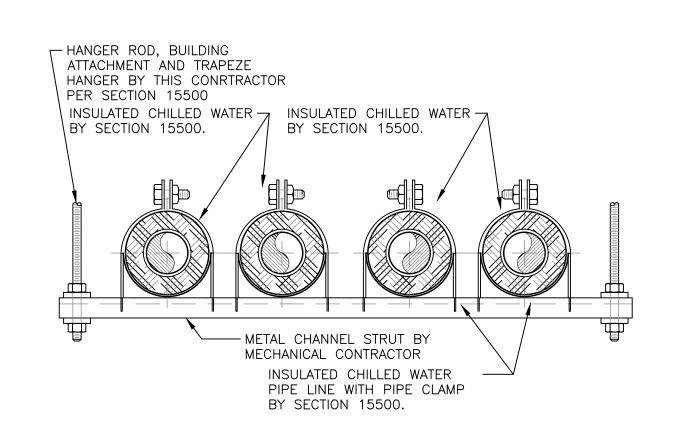
5 INSULATED PIPE HANGER DETAIL



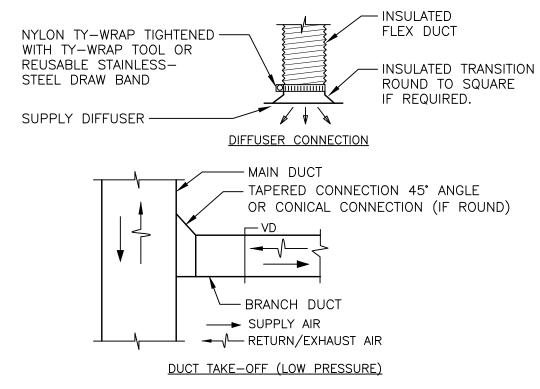
1. MAXIMUM 5'-0" LONG OF FLEXIBLE DUCT ON SUPPLY DUCTWORK ONLY. 2. 1/2" PER FOOT MAXIMUM SAG FOR FLEXIBLE DUCT.

3. COORDINATE FINAL LOCATION OF DIFFUSER WITH CEILING PLAN.

2 LAY-IN DIFFUSER DETAIL



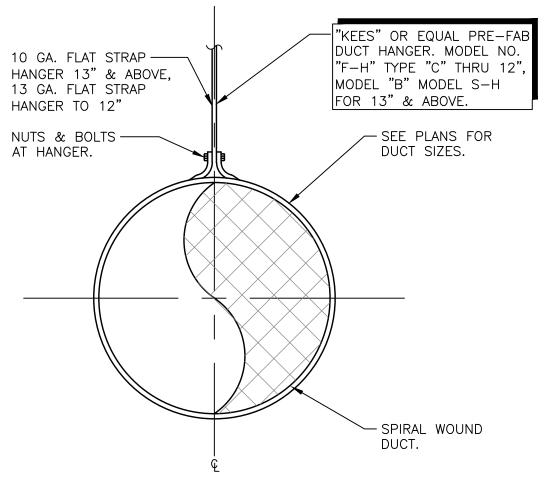
6 TRAPEZE HANGER DETAIL

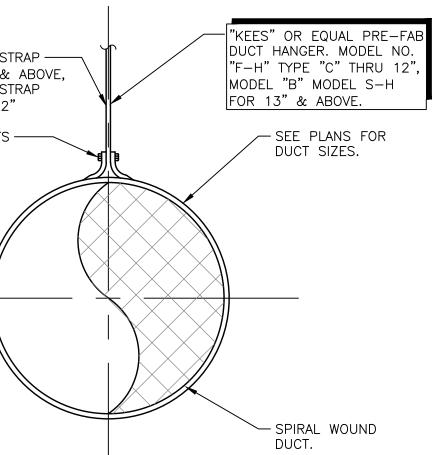


1. OFFSETS WITH FLEX DUCT SHALL NOT EXCEED 30° AND SHALL BE GRADUAL. OFFSETS IN EXCESS OF 30° SHALL BE HARD-DUCTED (GRADUAL 90° OFFSET PERMITTED WHERE SPACE IS AVAILABLE AND WHEN VELOCITY IS UNDER 500 FPM.)

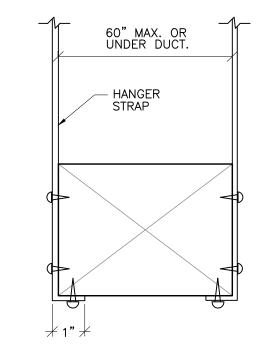
2. FLEX DUCT SHALL NOT HAVE MORE THAN 1/2" SAG PER FOOT. 3. LENGTH OF FLEX DUCT SHALL NOT EXCEED 5'-0". 4. PROVIDE DUCT MOUNTED VOLUME DAMPER TO DIFFUSER AS CLOSE TO MAIN DUCT AS POSSIBLE.

> BRANCH TAKE-OFF & DIFFUSER CONNECTIONS DETAIL





4 ROUND DUCT HANGER DETAIL



SIZE AND RATING OF HANGERS AND SUPPORTS SHALL BE PER LATEST "SMACNA" STANDARDS.

7 DUCT HANGING DETAIL

				PIPING S	SCHEDULE					
PIPE TYPE TAG		PIPE INFORMATION INSULATION INFORMATION								
	DESCRIPTION	SIZE (IN)	PIPE MATERIAL	FITTINGS TYPE	FITTINGS MATERIAL	TYPE	COVER	THICKNESS (IN)	REMARKS	
HWS	HOT WATER SUPPLY	0.75 - 2.0	TYPE L COPPER	SWEAT OR PRO PRESS	COPPER OR CAST BRASS	ASJ SSL FIBERGLASS	PVC	1.0	1,2,3,4,5,6,7,8	
HWS	HOT WATER SUPPLY	2.5 +	SCH 40 STEEL	THREADED OR PRO PRESS	MALLEABLE IRON	ASJ SSL FIBERGLASS	PVC	1.0	1,2,3,4,5,6,7,8	
HWR	HOT WATER RETURN	0.75 - 2.0	TYPE L COPPER	SWEAT OR PRO PRESS	COPPER OR CAST BRASS	ASJ SSL FIBERGLASS	PVC	1.0	1,2,3,4,5,6,7,8	
HWR	HOT WATER RETURN	2.5 +	SCH 40 STEEL	THREADED OR PRO PRESS	MALLEABLE IRON	ASJ SSL FIBERGLASS	PVC	1.0	1,2,3,4,5,6,7,8	

1. PROVIDE FITTINGS RATED FOR 250 PSI WORKING PRESSURE ON ALL PUMP APPLICATIONS

2. PIPING TO UTILIZE EXPANSION JOINTS AS REQUIRED 3. PROVIDE FACTORY FORMED FIBERGLASS FITTING COVERS OR MITERED JOINTS WITH SEALED ENDS.

4. PROVIDE FACTORY FORMED PVC COVERS ON ALL FITTINGS 5. PROVIDE PVC COVERS ON ALL EXPOSED PIPING THROUGHOUT

6. PROVIDE TYPE ASJ SSL FIBERGLASS PIPE INSULATION WITH INTEGRAL VAPOR BARRIER.

7. PIPING SHALL BE LABELED INDICATING PIPE USAGE USING ADHESIVE TYPE LABELS WITH WHITE BACKGROUND AND BLACK LETTERING. 8. PIPING SHALL BE LABELED INDICATING PIPE FLOW DIRECTION USING ADHESIVE TYPE LABELS WITH WHITE BACKGROUND AND BLACK ARROWS.

	DIFFUSERS, GRILLES & REGISTERS SCHEDULE												
TAG NUMBER					MOUNTING	MANUFACTURER MODEL NUMBER R (BASIS OF DESIGN)							
SD-1	24×24	SEE PLAN TAGS	0-400	SUPPLY DIFFUSER	CEILING	-	NAILOR RNS	1					
RG-1	24×24	SEE PLAN TAGS	0-1,200	RETURN GRILLE	WALL	RETURN PLENUM WITH ROUND COLLAR	NAILOR 51EC	1,2					

REMARKS: 1. COORDINATE CEILING TYPE WITH ARCHITECTURAL.

2. PAINT INSIDE OF PLENUM FLAT BLACK.

	HOT WATER DUCT COIL SCHEDULE																			
TAG	COIL SIZE	CONN.	COIL AIRFLOW	COIL AIRFLOW	COIL HEATING					WATER DATA					PHYSICAL DATA WEIGHT DIMENSIONS (IN)			MANUFACTURER		
NUMBER	(IN)	TYPE	(CEM)	P.D. (IN.WG.)	CAPACITY (BTUH)			EWT (°F)		ROWS	FLOW (GPM)	P.D. (FT.WG.)	FPI	GLYCOL (%)	WEIGHT (LBS)		HEIGHT	T .	MODEL NUMBER (BASIS OF DESIGN)	1
DH-1	12X10	FLANGED	395	0.24	21,400	45	95	190	170	3	2.14	1.64	10	40	13.0	12	10	7.5	NAILOR 31HWC	1
DH-2	12X8	FLANGED	155	0.05	8,300	45	95	190	170	2	0.83	0.21	10	40	7.0	12	10	5.5	NAILOR 31HWC	1
DH-3	12X8	FLANGED	120	0.03	6,500	45	95	190	170	2	0.65	0.09	10	40	7.0	12	10	5.5	NAILOR 31HWC	1
DH-4	12X8	FLANGED	230	0.15	12,900	45	95	190	170	3	1.29	0.46	10	40	13.0	12	10	7.5	NAILOR 31HWC	1
DH-5	12X8	FLANGED	255	0.18	13,800	45	95	190	170	3	1.38	0.55	10	40	13.0	12	10	7.5	NAILOR 31HWC	1

REMARKS: 1. PROVIDE TRANSITION FITTINGS FROM DUCT SIZE TO FLANGE SIZE AS NECESSARY.

	STRUCTIC CUMENTS

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MacRitchie Engineering, Inc.

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SHEET TITLE

Mechanical Details & Schedules

M-2.0

GENERAL NOTES:

ABBR	<u>EVIATIONS</u>
A	AMPS
ABV	ABOVE
AC	ALTERNATING CURRENT
AF	AMP FRAME
AFC	ABOVE FINISHED CEILING
AFF	ABOVE FINISHED FLOOR
AFG A/C	ABOVE FINISHED GRADE AIR CONDITIONING
AL	ALUMINUM
AMP	AMPERE
ANN	ANNUNCIATOR ARCHITECTURAL
ARCH ASYM	ASYMMETRICAL
AT	AMP TRIP
ATS	AUTOMATIC TRANSFER SWITC
AVG	AVERAGE
BKR	BREAKER
BL	BLANK
BLDG	BUILDING
C	CONDUIT
CAT	CATALOG
CKT	CIRCUIT
CLG	CEILING
COL	COLUMN
CONC	CONCRETE
CT CTE	CURRENT TRANSFORMER CONNECT TO EXISTING
CU	COPPER DIAMETER
DIA DISC	DISCONNECT
DIST	DISTRIBUTION
DN	DOWN
DP	DISTRIBUTION PANEL
DET	DETAIL
DWG	DRAWING
E	EMERGENCY
EA	EACH
EC	ELECTRICAL CONTRACTOR
	ELECTRIC(AL) ELEVATOR
EM	EMERGENCY EQUAL
EQ EQUIP	EQUIPMENT
EWC EXIST	ELECTRIC WATER COOLER EXISTING
FLR	FLOOR
F/A	FIRE ALARM
FBO FIN	FURNISHED BY OWNER FINISH
FIXT	FIXTURE
FL	FLUSH
FLUOR FT	FLUORESCENT
G	FEET GROUND
GA	GAUGE
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GDO	GARAGE DECON OPEN
GFI GND	GROUND FAULT INTERRUPTE GROUND
H	HERMETIC
HGT	HEIGHT
HOA	HAND-OFF-AUTO
HP	HORIZONTAL HORSEPOWER
HTG	HEATING
HVAC	HEATING, VENTILATION & AII
IN.	CONDITIONING INCHES
INCD.	INCANDESCENT
J/JB	JUNCTION BOX
KW	KILOWATT
KVA	KILOVOLT—AMPERES
KWH	KILOWATT—HOURS
LA	LIGHTNING ARRESTOR
LTG	LIGHTING
MACH	MACHINE
MAX	MAXIMUM
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER THOUSAND CIRCULAR MILS
MCM MECH	MECHANICAL
MFR	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MTD	MOUNTED
MTS	MANUAL TRANSFER SWITCH
N	NEUTRAL
N/A NC	NOT APPLICABLE NORMALLY CLOSED
NEC	NATIONAL ELECTRIC CODE
NEMA	NATIONAL ELECTRICAL
NIC	MANUFACTURERS ASSOCIATION NOT IN CONTRACT
NO NTS	NORMALLY OPEN NOT TO SCALE
Р	POLE
PB PC	PULLBOX PLUMBING CONTRACTOR
PF	POWER FACTOR
PH	PHASE
	PANEL PRIMARY
	POWER POTENTIAL TRANSFORMER
RCPT	RECEPTACLE
REQD	REQUIRED
RM	ROOM
RMS	ROOT MEANS SQUARE
SEC	SECONDARY
SP	SPARE
SPEC(S)	
ST SQ	SQUARE
STD	STANDARD
SURF	SURFACE
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
SYM	SYMMETRICAL
SYS	SYSTEM
TEL	TELEPHONE
TELCO	TELEPHONE COMPANY

TELEPHONE COMPANY

- 1. ALL ELECTRICAL WORK SHALL BE IN STRICT COMPLIANCE WITH THE CURRENTLY EFFECTIVE EDITION OF THE NEC AS ADOPTED BY THE LOCAL JURISDICTION INCLUDING ANY LOCAL AMENDMENTS. AS WELL AS COMPLY WITH ANY APPLICABLE FEDERAL AND STATE REGULATIONS.
- 2. SECURE AND PAY FOR ALL PERMITS AND FEES NECESSARY FOR EXECUTION AND COMPLETION OF ELECTRICAL WORK.
- 3. FOR QUALITY ASSURANCE, ALL EQUIPMENT SHALL BE UL LISTED AND APPROVED. ALSO, PERFORM WORK IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CONTRACTOR ASSOCIATION (NECA) "STANDARD OF INSTALLATION".
- 4. "FURNISH" SHALL BE DEFINED AS TO SUPPLY AND DELIVER TO THE PROJECT SITE, READY FOR UNLOADING, UNPACKING, ASSEMBLY, INSTALLATION AND SIMILAR OPERATIONS. "INSTALL" SHALL BE DEFINED AS WORK WHICH INCLUDES THE ACTUAL UNLOADING, UNPACKING, ASSEMBLY, INSTALLATION AND SIMILAR OPERATIONS. "PROVIDE" SHALL BE DEFINED AS TO FURNISH AND INSTALL, COMPLETE AND READY FOR THE INTENDED USE. "WIRING" SHALL BE DEFINED AS TO BE ALL INCLUSIVE OF RACEWAYS, CONDUCTORS, JUNCTION BOXES, SAFETY SWITCHES AND MAKING FINAL CONNECTIONS.
- 5. CAREFULLY EXAMINE SITE AND COMPARE THE DRAWINGS WITH EXISTING ELECTRICAL INSTALLATIONS. BE THOROUGHLY AWARE OF ALL EXISTING CONDITIONS WITHIN THE SCOPE OF WORK. BY THE ACT OF SUBMITTING A BID, THE CONTRACTOR SHALL HAVE DEEMED TO HAVE MADE SUCH EXAMINATION AND TO HAVE ACCEPTED SUCH CONDITIONS AND TO HAVE MADE ALLOWANCE THEREFORE IN PREPARING THEIR BID.
- 6. ELECTRICAL DRAWINGS ARE DIAGRAMMATIC. SIZE AND LOCATION OF EQUIPMENT AND WIRING ARE SHOWN TO SCALE WHERE POSSIBLE, BUT MAY BE DISTORTED FOR CLARITY ON THE DRAWINGS. FINAL LOCATIONS OF OUTLETS AND EQUIPMENT SHALL BE AS SHOWN IN ENLARGED DETAILS OR AS APPROVED BY THE ARCHITECT.
- 7. IT IS NOT INTENDED THAT THE PLANS INDICATE ALL THE NECESSARY BENDS, OFFSETS, PULL BOXES AND OBSTRUCTIONS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO INSTALL THEIR WORK TO CONFORM TO THE STRUCTURE, MAINTAIN HEADROOM AND KEEP OPENINGS AND PASSAGEWAYS CLEAR. REFER TO THE ARCHITECTURAL DRAWINGS FOR DIMENSIONS.
- 8. VERIFY LOCATIONS OF ALL ELECTRICAL EQUIPMENT WITH ARCHITECTURAL DRAWINGS AND INTERIOR DETAILS AND FINISHES. IN CENTERING OUTLETS AND LOCATING BOXES AND OUTLETS, ALLOW FOR OVERHEAD PIPES, DUCTS, AND MECHANICAL EQUIPMENT, VARIATIONS IN FIREPROOFING AND PLASTERING, WINDOW AND DOOR TRIM, PANELING, HUNG CEILINGS AND THE LIKE, AND CORRECT ANY INACCURACY RESULTING FROM FAILURE TO DO SO WITHOUT EXPENSE TO THE OWNER.
- 9. CHECK ARCHITECTURAL AND MECHANICAL DRAWINGS AND SPECIFICATIONS FOR EQUIPMENT TO BE INSTALLED BY OTHERS. BE RESPONSIBLE FOR PROPER WIRING AND NECESSARY ELECTRICAL ADJUSTMENTS TO EQUIPMENT TO CONFORM TO SPECIFIED REQUIREMENTS OF THE EQUIPMENT.
- RISER DIAGRAMS AND VISE VERSA SHALL BE CONSIDERED INCLUDED UNDER CONTRACT WORK. 11. PROVIDE ALL NECESSARY EXCAVATING AND BACKFILLING FOR

10. ALL COMPONENTS SHOWN ON PLANS WHETHER OR NOT ON

- RELATED ELECTRICAL WORK. 12. NO MORE THAN THREE CURRENT CARRYING CONDUCTORS
- FACTORS IN NEC ARTICLE 310 ARE APPLIED. 13. INSTALL BLACK PHENOLIC NAMEPLATES WITH WHITE ENGRAVED DESIGNATIONS FOR PANELBOARDS, PANELBOARD FEEDER DEVICES, JUNCTION BOXES, AND PULL BOXES.

SHALL BE INSTALLED WITHIN RACEWAYS UNLESS DERATING

- 14. TEMPORARY ELECTRICAL SERVICE, LIGHTING, AND RELATED WIRING SHALL BE PROVIDED IN ACCORDANCE WITH OSHA REQUIREMENTS FOR THE USE OF ALL TRADES DURING CONSTRUCTION. TEMPORARY POWER MAY BE EXTENDED FROM THE OWNERS EXISTING ELECTRICAL SERVICE. THE POINT OF CONNECTION AND METHOD OF EXTENSION SHALL BE APPROVED BY THE OWNER. DEMOLITION OF EXISTING ELECTRICAL EQUIPMENT IS A PART OF THE ELECTRICAL WORK AND IS DESCRIBED ON THE DRAWINGS.
- 15. PROVIDE LUMINAIRES AS SHOWN ON THE ELECTRICAL AND ARCHITECTURAL DRAWINGS. VERIFY EXACT LOCATIONS OF FIXTURES WITH ARCHITECTURAL REFLECTED CEILING PLANS. COORDINATE FIXTURE HOUSINGS AND TRIMS WITH CEILING TYPE. PROVIDE REQUIRED ACCESSORIES FOR CEILING TYPES. ION 16. WHERE MULTIPLE DEVICES ARE INDICATED IN A COMMON LOCATION, GANG INTO A SINGLE COVER PLATE. COLORS OF ALL WIRING DEVICES AND ASSOCIATED COVERPLATES SHALL

BE PER ARCHITECT'S DIRECTIONS EXCEPT FOR EMERGENCY

17. RACEWAYS SHALL BE INSTALLED CONCEALED IN FINISHED AREAS, UNLESS OTHERWISE NOTED ON THE DRAWINGS.

DEVICES.

- 18. PROVIDE NEMA RATED, ACCESSIBLE, SCREW COVER. PULL BOXES IN CONDUIT RUNS LONGER THAN 100 FEET AND AS REQUIRED TO LIMIT NUMBER OF BENDS TO 270 DEGREES TOTAL. SIZE PULL BOXES IN ACCORDANCE WITH NEC.
- 19. PROVIDE NEW TYPE WRITTEN DIRECTORIES FOR ALL PANELS INSTALLED OR MODIFIED UNDER THIS CONTRACT.
- 20. VERIFY EQUIPMENT FAULT CURRENT INTERRUPTING CAPACITY REQUIREMENTS PRIOR TO ORDERING ANY RELATED ELECTRICAL DISTRIBUTION EQUIPMENT. PROVIDE COPY OF POWER COMPANY'S CALCULATED MAXIMUM AVAILABLE FAULT CURRENT TO ENGINEER FOR REVIEW AND APPROVAL.

- 21. TOGGLE SWITCHES SHALL BE LOCATED AT OR NEAR DOORS. INSTALL SWITCHES ON SIDE OPPOSITE HINGE. VERIFY FINAL DOOR HINGE LOCATION IN FIELD PRIOR TO INSTALLATION.
- 22. LOCATIONS FOR WIRING DEVICES SHALL BE SUBJECT TO MODIFICATIONS PRIOR TO ROUGH-IN AT NO ADDITIONAL COST
- 23. HEIGHT OF WIRING DEVICES ARE DEFINED FROM FINISHED FLOOR TO CENTERLINE OF DEVICE AS PER ARCHITECTURAL DRAWINGS, EXCEPT JUNCTION OF DIFFERENT WALL FINISH MATERIALS, MOLDINGS, BREAKS IN WALL SURFACE, MASONRY, GROUT LINES, OR WHERE IN VIOLATION OF CODE.
- 23. PROVIDE REQUIRED EXPANSION/DEFLECTION FITTINGS AT LOCATIONS WHERE CONDUIT PASSES THROUGH EXPANSION JOINTS. FITTINGS SHALL ALLOW SEISMIC MOVEMENT REQUIRED BY STRUCTURAL ENGINEER.
- 24. PROVIDE BACK-TO-BACK OUTLETS BETWEEN OUTLET BOXES INSTALLED ON OPPOSITE SIDES OF A COMMON WALL SO AS TO MAINTAIN ACOUSTICAL INTEGRITY OF WALL AND FIRE RATING. BACK-TO-BACK OUTLETS SHALL BE INSTALLED IN SEPARATE STUD CAVITIES. PROVIDE UL LISTED FIRE RATED SEALS FOR ALL RACEWAY PENETRATIONS THROUGH FIRE RATED WALLS, SLABS, AND CEILINGS IN ACCORDANCE WITH NEC 300.21. PROPOSED FIRE-STOP MATERIAL AND SYSTEM SHALL BE SUBMITTED TO THE LOCAL FIRE INSPECTOR FOR AHJ APPROVAL PRIOR TO INSTALLATION.
- 25. PROVIDE AN INSULATED GROUNDING CONDUCTOR INSTALLED WITH EACH FEEDER AND EACH BRANCH CIRCUIT. IN ALL CONDUITS WHETHER OR NOT INDICATED ON DRAWINGS. GROUNDING CONDUCTORS SHALL BE AS SHOWN ON DRAWINGS OR SIZED IN ACCORDANCE WITH NEC. PROVIDE GROUNDING CONDUCTOR IN ALL TELEPHONE AND CATV SERVICE CONDUITS.
- 26. VOICE/DATA OUTLETS SHALL BE INSTALLED IN 4" SQUARE BOXES, 2-1/8" MINIMUM DEPTH WITH COVER PLATE. EXTEND 1" CONDUIT WITH PULL WIRE 6" ABOVE ACCESSIBLE CEILING. TERMINATE WITH INSULATED THROAT BUSHING.
- 27. PROVIDE ALL CUTTING AND PATCHING WHICH MAY BE REQUIRED FOR THE PROPER INSTALLATION OF THE NEW ELECTRICAL WORK. ALL PATCHING SHALL BE OF THE SAME MATERIALS, WORKMANSHIP, AND FINISH AND SHALL ACCURATELY MATCH ALL ADJACENT WORK.
- 28. DISCONNECT AND REMOVE ALL TEMPORARY POWER INCLUDING BUT NOT NECESSARILY LIMITED TO PANELS, FIXTURES, BOXES, AND WIRING. CLEAN UP RESULTANT DEBRIS FROM THIS WORK AND REMOVE FROM THE SITE.
- 29. JEST FOR GROUNDS AND SHORTS, TO INSURE PROPER OPERATION OF ELECTRICAL EQUIPMENT. REPAIR OR REPLACE FAULTY EQUIPMENT AT NO ADDITIONAL COST TO THE OWNER.
- 30. FOR DURATION OF CONTRACT, MAINTAIN A SEPARATE SET OF CONTRACT DRAWINGS. RECORD WORK COMPLETED AND ALL CHANGES. INCLUDE ACTUAL LOCATION OF EXISTING UTILITIES IF THEY DIFFER FROM DESIGN DOCUMENTS. UNDERGROUND AND UTILITY WORK SHALL BE LOCATED BY DISTANCES TO LANDMARKS, SUCH AS BUILDING FOUNDATIONS. GIVE ACTUAL DIMENSIONS OF EVERYTHING INSTALLED INCLUDING ELEVATIONS AND ELEVATIONS AT EACH CHANGE IN DIRECTION. DRAWINGS SHALL SHOW RECORD CONDITION OF DETAILS, SECTIONS, RISER DIAGRAMS AND CORRECTIONS TO SCHEDULES. PROVIDE A MINIMUM OF ONE (1) SET OF RECORD DRAWINGS TO ARCHITECT OR OWNER. THESE DRAWINGS SHALL SHOW EXACT EQUIPMENT LOCATIONS. CONCEALED FEEDER ROUTINGS, AND SHALL INDICATE THE "AS-BUILT" CONDITION. DRAWINGS SHALL BE PROVIDED IN AUTOCAD FORMAT.
- 31. ELECTRICAL AND FIRE ALARM WIRING SHALL BE SUPPORTED INDEPENDENTLY; IT SHALL NOT BE RUN WITH OR SUPPORTED BY PIPING OR PIPING SUPPORTS INSTALLED FOR OTHER

WIRING DEVICES

DESCRIPTION

125 VOLT, 2 POLE, 3 WIRE, 20 AMP., DUPLEX RECEPTACLE. SHADED CENTER INDICATES ABOVE COUNTER MOUNTING. "2" INDICATES CIRCUIT NUMBER. 125 VOLT, 2 POLE, 3 WIRE, 20 AMP., DUPLEX



RECEPTACLE. SHADED CENTER INDICATES ABOVE COUNTER MOUNTING. "U" USB RECEPTACLE LEVITON MODEL T5833-W OR APPROVED EQUAL.

RECEPTACLE EQUIPPED WITH INTEGRAL GROUND

FAULT INTERRUPTER. SHADED CENTER INDICATES

125V, 2 POLE, 3 WIRE, 20 AMP., DUPLEX RECEPTACLE. SHADED SIDE INDICATES TOP RECEPTACLE SHALL BE CONTROLLED. SEE DETAIL # 2 125 VOLT, 2 POLE, 3 WIRE, 20 AMP., DUPLEX

ABOVE COUNTER MOUNTING.



DOUBLE DUPLEX (QUAD) RECEPTACLES.

125 VOLT, 2 POLE, 3 WIRE, 20 AMP., DUPLEX RECEPTACLE: SQUARE INDICATES DEVICE MOUNTED FLUSH IN FLOOR.

LIGHTING EQUIPMENT

DESCRIPTION

SYMBOL LUMINAIRES. REFER TO "LUMINAIRE SCHEDULE"



CEILING MOUNTED OR WALL MOUNTED ILLUMINATED "EXIT" SIGN WITH BATTERY BACK-UP AND EMERGENCY LIGHTS. PROVIDE DIRECTIONAL ARROWS AS INDICATED ON FLOOR PLANS. EMERGI-LITE WPR-624-4-R 2-LB-ADNA-VR1. VERIFY COLORS WITH ARCHITECT PRIOR TO PROVIDING SUBMITTALS

EMERGENCY LIGHTING BATTERY UNIT WITH HEADS AS INDICATED.

> CONNECT EMERGENCY LIGHTING BATTERY UNITS AND EXIT SIGNS TO LOCAL LIGHTING CIRCUITRY, AHEAD OF ANY SWITCHING. SEE NFPA-70 ARTICLE 700.12.F.

COMMUNICATIONS SYMBOL LEGEND

- WALL MOUNTED DATA OUTLET. ALL TEL/DATA CABLING SHALL BE PROVIDED BY MELMARK'S SEPARATE VENDORS, ELECTRICIAN TO PROVIDE J-BOX AND CONDUIT WITH PULL STRING TO ABOVE CEILING AT EACH LOCATION.
- WALL MOUNTED COMBINATION TELE/DATA OUTLET. ALL TEL/DATA CABLING SHALL BE PROVIDED BY MELMARK'S SEPARATE VENDORS. ELECTRICIAN TO PROVIDE J-BOX AND CONDUIT WITH PULL STRING TO ABOVE CEILING AT EACH LOCATION.
- TV OUTLET. PROVIDE TWO GANG BOX WITH TWO GANG COVER PLATE, DUPLEX RECEPTACLE. ALL TEL/DATA CABLING SHALL BE PROVIDED BY MELMARK'S SEPARATE VENDORS. ELECTRICIAN TO PROVIDE J-BOX AND CONDUIT WITH PULL STRING TO ABOVE CEILING AT EACH LOCATION.

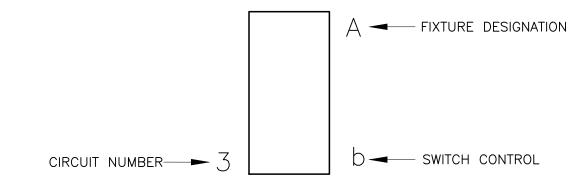
TOUCHE LIGHT CONTROLS

DESCRIPTION

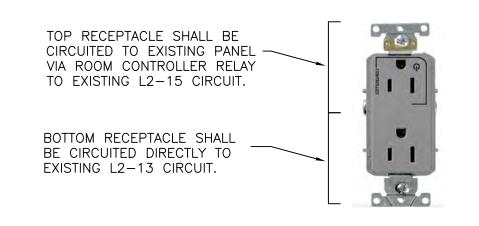
ROOM MANAGER: RM

SMART SENSOR- OCCUPANCY/PHOTO SENSOR; SMAOS-L

SMART SWITCH - TWO BUTTON; SS-2B-WHT









LUMENAIRE SCHEDULE LIGHT SOURCE TYPE DESCRIPTION MANUFACTURER AND CATALOG NUMBER | MOUNTING REMARKS TYPE WATTS TEMP LUMENS VOLTS TCP Lighting LED DIRECT TROFFER LUMINAIRES 2X2 RECESSED LED 38 35 3500 120-277 DTF4UZD3935K 4" ROUND, F-CLASS GEN V Vantage Lighting LED RECESSED 120-277 SPECIFY LUMENS WITH ARCHITEC OPEN LED DOWNLIGHT A4VOFLEDU-xx35K-L4060-SGC-ZDM TCP Lighting LED 120-277 LED GENERAL PUROSE STRIP LUMINAIRES SURFACE 20 35 2500 TCPGPS2UZDA835K



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CLIENT



TOWN OF ARLINGTON **FACILITIES DEPARTMENT** 869 MASSACHUSETTS AVE ARLINGTON, MA, 02476 781-316-3110

PROJECT

JOHN A. BISHOP ELEMENTARY SCHOOL OFFICE RENOVATION PROJECT 25 COLUMBIA RD ARLINGTON, MA, 02474

REVISIONS



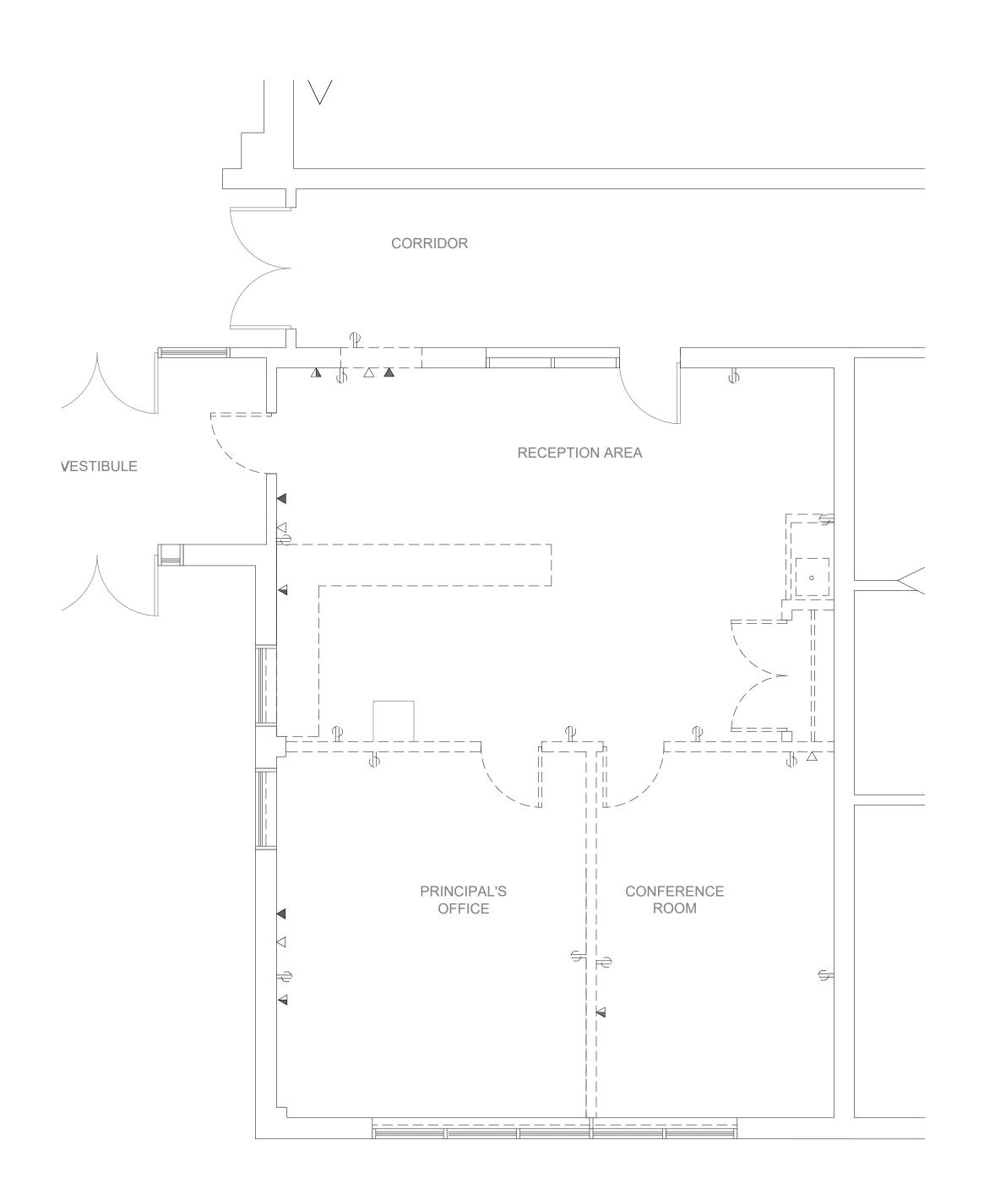
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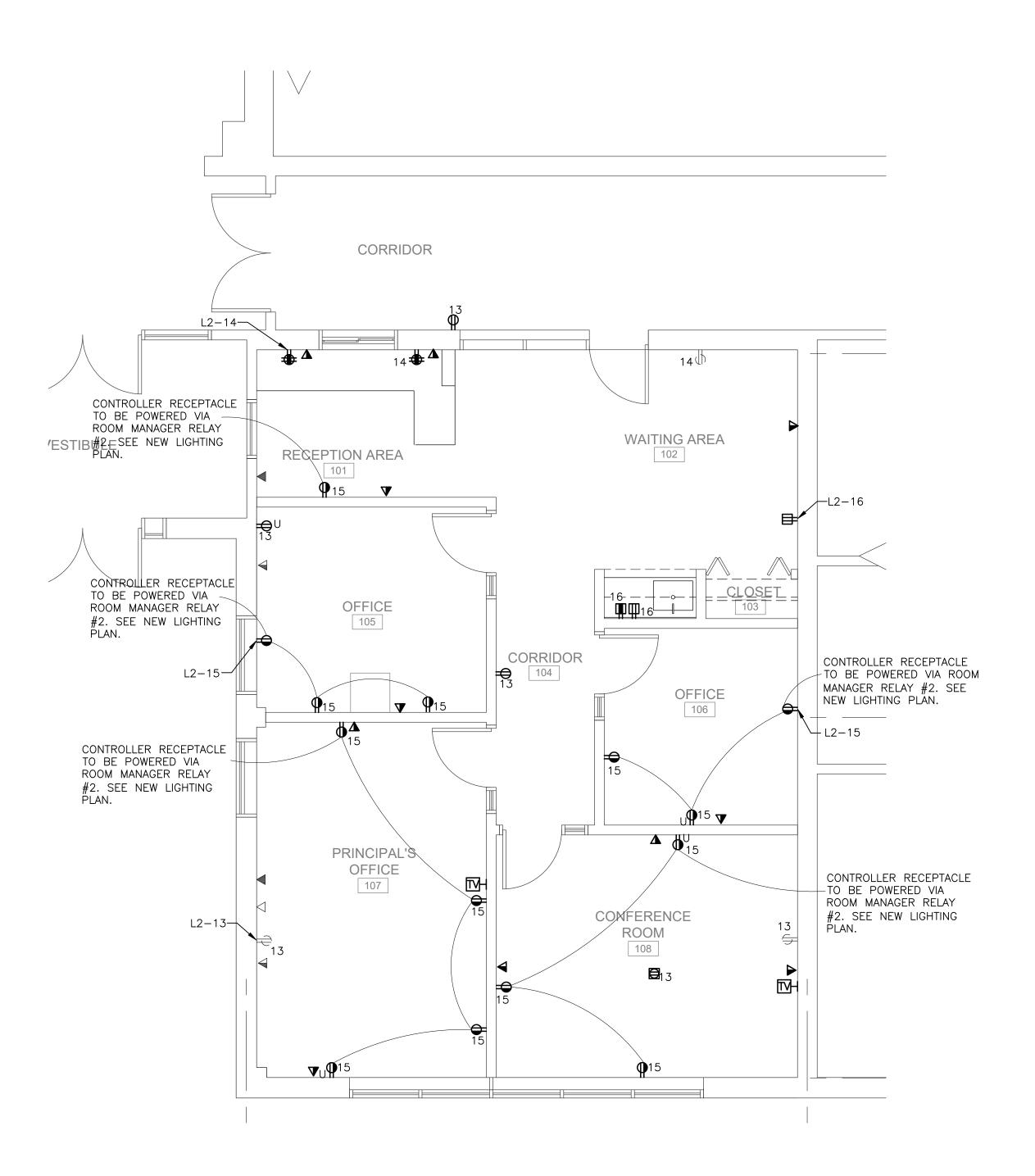
Electrical Legend, Notes. & Abbreviations

E-0.0



1 EXISTING/DEMO POWER FLOOR PLAN

SCALE: 1/4" = 1'-0"



2 NEW POWER FLOOR PLAN
SCALE: 1/4" = 1'-0"



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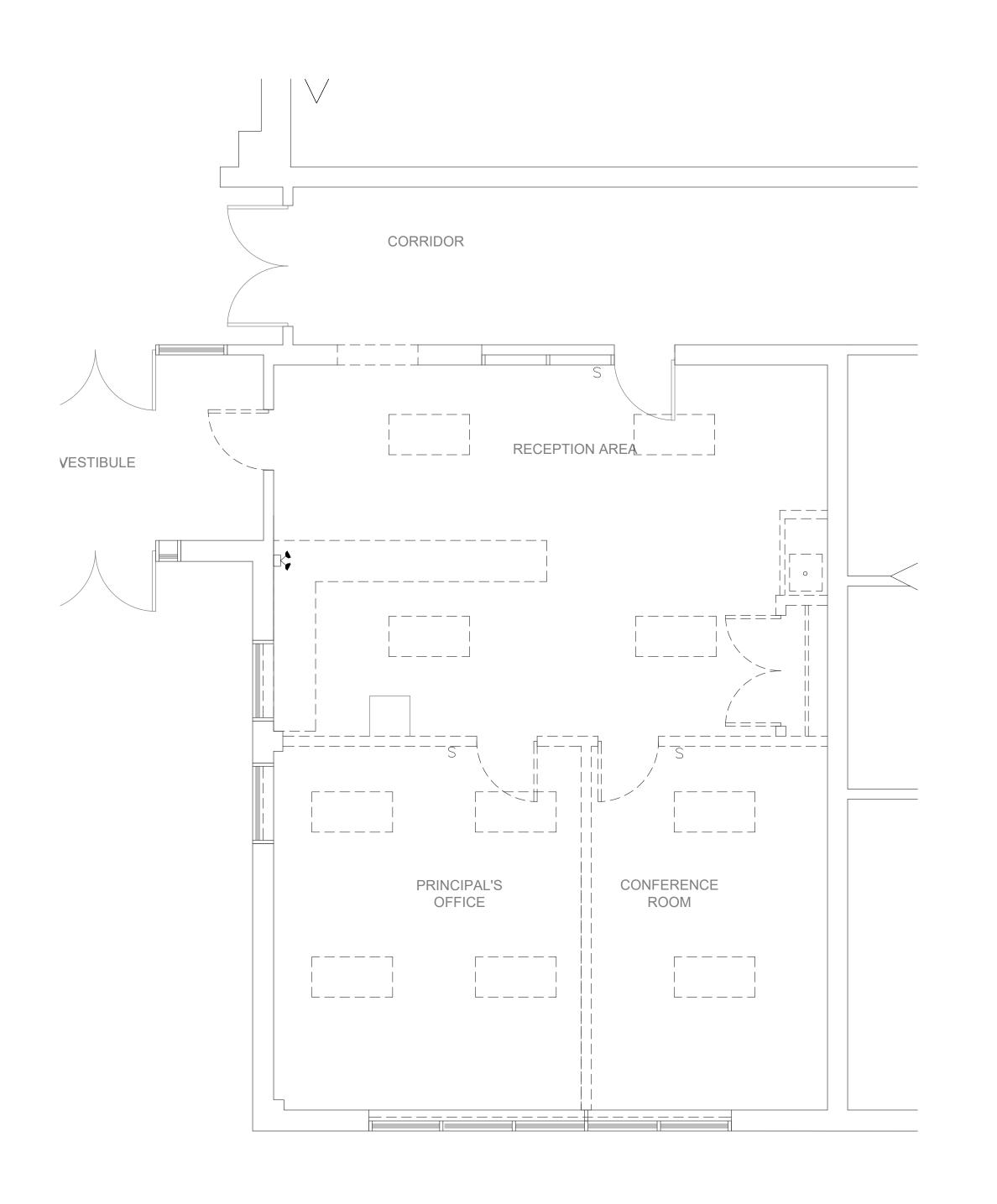
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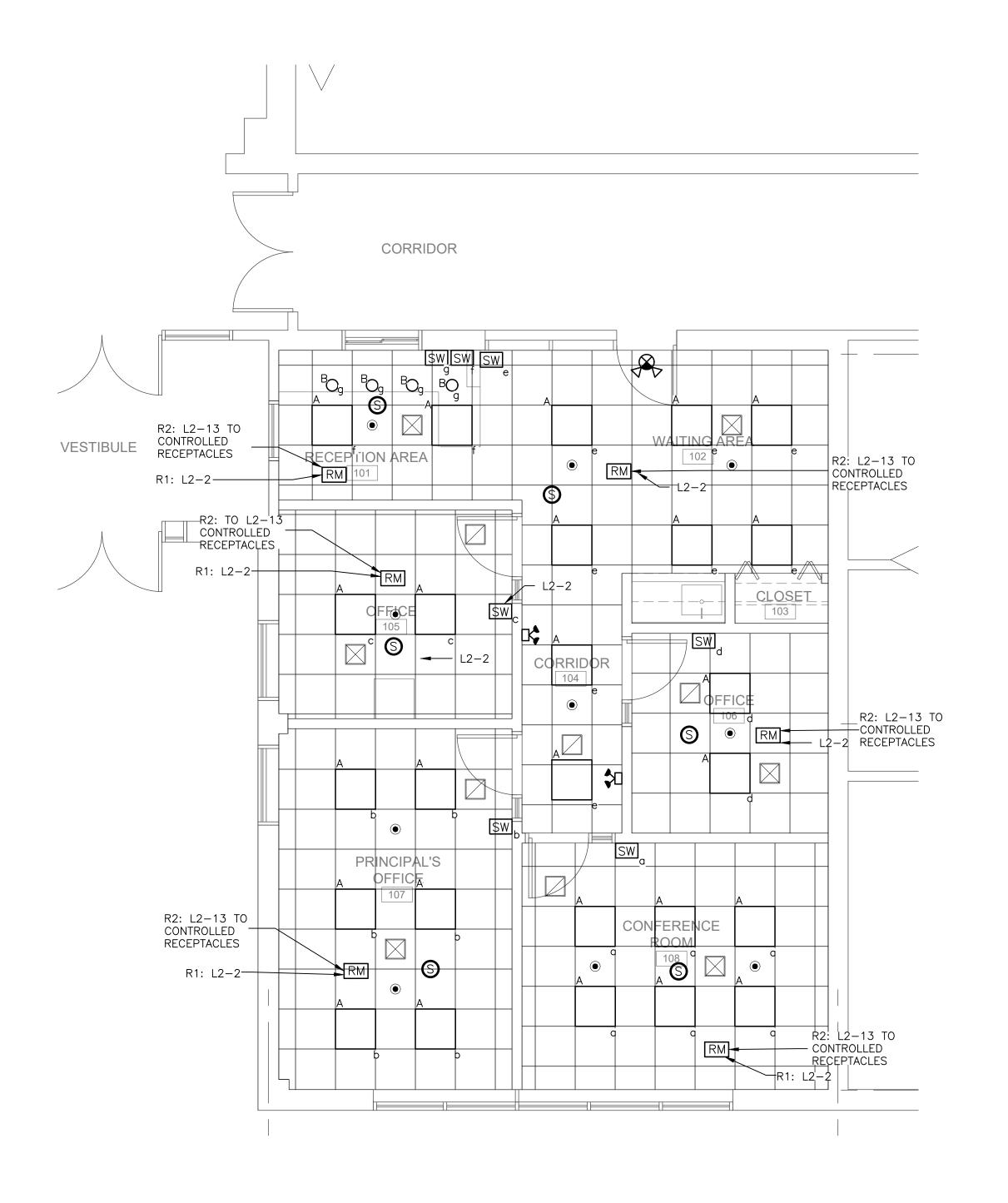
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SHEET TITLE

Electrical Demolition and New Power and Data Plans

E-1.0





1 EXISTING/DEMO LIGHTING PLAN
SCALE: 1/4" = 1'-0"





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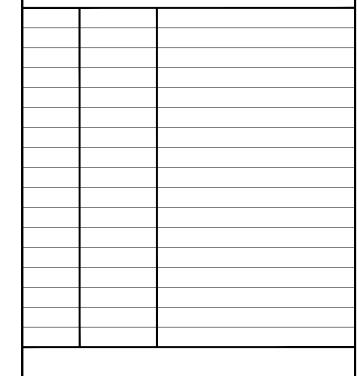


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SHEET TITLE

Electrical Demolition and New Lighting Plans

E-1.1

FIRE ALARM NOTES:

- 1. REFER TO FLOOR PLAN FOR EXACT QUANTITIES AND LOCATIONS OF DEVICES. COORDINATE EXACT MTG. LOCATION AND HEIGHT WITH ARCHITECTURAL DRAWINGS.
- 2. ALL COMPONENTS SHOWN ON THE RISER DIAGRAMS, BUT NOT ON THE PLAN OR VICE VERSA, SHALL BE INCLUDED AS IF SHOWN ON BOTH.
- 3. ALL SLC, IDC, AND NAC WIRING SHALL BE CLASS 'A', WIRED PER MANUFACTURER'S SPECIFICATIONS. WIRING SHALL BE PER NFPA 70 AND PER NFPA 72. WIRING SHALL BE RUN CONCEALED OR IN EMT WHERE EXPOSED.
- 4. ALL WIRING SHALL BE RUN CONCEALED UNLESS SPECIFIED OTHERWISE. EXPOSED WIRING SHALL BE IN CONDUIT AND RUN FLUSH TO THE STRUCTURE IN A NEAT RECTILINEAR MANNER, ALWAYS PERPENDICULAR TO WALLS.
- ALL RACEWAYS RUNNING THROUGH BUILDING EXPANSION JOINTS SHALL BE EQUIPPED WITH EXPANSION FITTINGS. COORDINATE WITH ARCHITECTURAL AND STRUCTURAL PLANS.
- 6. ALL RACEWAYS RUNNING THROUGH BUILDING FIRE WALLS OR SMOKE BARRIERS SHALL BE SEALED AROUND WITH APPROVED FIRE SEALANT, BY THE FIRE ALARM SYSTEM INSTALLER. COORDINATE WITH ARCHITECTURAL PLANS.
- 7. AS BUILT PLANS CABINET SHALL BE LOCATED SEMI—FLUSH IN WALL BELOW FIRE ALARM SYSTEM REMOTE ANNUNCIATOR IN MAIN ENTRY VESTIBULE. COORDINATE EXACT LOCATION AND MOUNTING WITH ARCHITECT.
- 8. COORDINATE FIRE ALARM SYSTEM REQUIREMENTS WITH FIRE PROTECTION OFFICER OF LOCAL FIRE DEPARTMENT PRIOR TO SUBMITTING SHOP DRAWINGS TO ARCHITECT FOR APPROVAL.
- 9. PROVIDE A MINIMUM OF 20% SPARE CAPACITY IN THE NOTIFICATION APPLIANCE CIRCUITRY (INCLUDING BATTERY CAPACITY) FOR ADDITIONAL NOTIFICATION APPLIANCES WHICH MAY BE REQUIRED FOR THE FUTURE HEARING IMPAIRED (SEE 907.5.2.3.2).
- 10. LOCATIONS OF DEVICES ARE SHOWN BASED UPON CODE REQUIRED CALCULATIONS PERFORMED BY THE ELECTRICAL ENGINEER. DEVICES SHALL NOT BE RELOCATED WITHOUT WRITTEN PERMISSION FROM THE ENGINEER OF RECORD. SEND ALL PROPOSED LOCATION CHANGES IN WRITING, ALL AT THE SAME TIME, FOR APPROVAL IN THE FORM OF SKETCHES WITH DIMENSIONS. VERBAL REQUESTS SHALL NOT BE PERMITTED FOR CHANGING THE LOCATIONS OF LIFE SAFETY DEVICES AND EQUIPMENT.
- 11. MANUAL (PULL) STATIONS SHALL BE INSTALLED WITHIN 5'-0" OF THE PULL SIDE OF THE EGRESS DOOR THAT THEY SERVE. COORDINATE EXACT LOCATION WITH ARCHITECT
- 12. ALL SMOKE DETECTORS SHALL BE INSTALLED AS SHOWN, PER THE MANUFACTURER'S RECOMMENDATIONS AND SHALL BE KEPT A MINIMUM OF 36" FROM ANY SUPPLY OR RETURN DIFFUSER, INCLUDING EXHAUST GRILLS AND/OR DIFFUSERS.

FIRE ALARM SYMBOL LEGEND

SYMBOL DESCRIPTION

F ADDRESSABLE MANUAL PULL STATION. PROVIDE WITH "STI" STOPPER II COVERS OR APPROVED EQUAL.

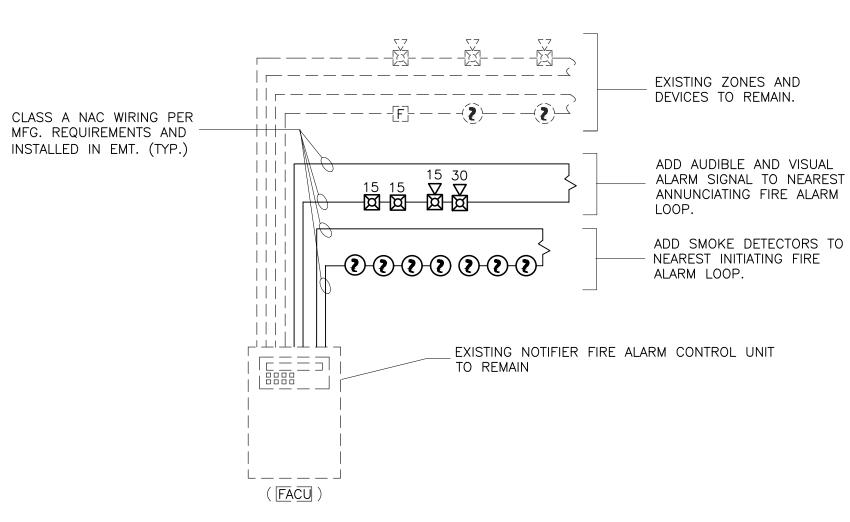
addressable photoelectric smoke detector.

☑15 VISUAL ONLY ALARM SIGNAL.

__C ☑️◯ 15 AUDIBLE AND VISUAL ALARM SIGNAL.

"#" DENOTES MINIMUM CANDELA RATING."C" DENOTES CEILING MOUNTED DEVICE."MH" DENOTES DEVICE INTENDED TO FIT INTO A SINGLE GANG DEVICE BOX (MINI-HORN).

FACU FIRE ALARM SYSTEM CONTROL UNIT.



TYP FIRE ALARM RISER DIAGRAM DETAIL

NOT TO SCALE

NOTES:

1. NEW FIRE ALARM DEVICES TO BE COMPLETELY

COMPARABLE WITH EXISTING FIRE ALARM SYSTEM.

2. NEW FIRE ALARM DEVICES SHALL BE ADDED TO NEAREST

LOOP/ZONE.

3. PROGRAMMING SHALL BE UPDATED AS REQUIRED FOR EXISTING FIRE ALARM CONTROL UNIT. FIRE ALARM SYSTEM SHALL BE TESTED UPON COMPLETION OF NEW WORK.



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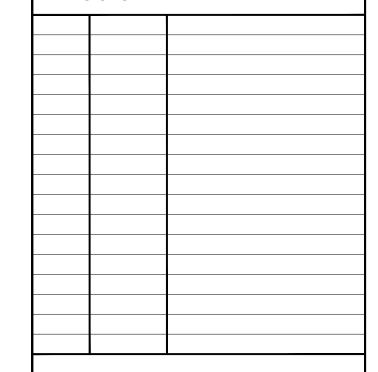


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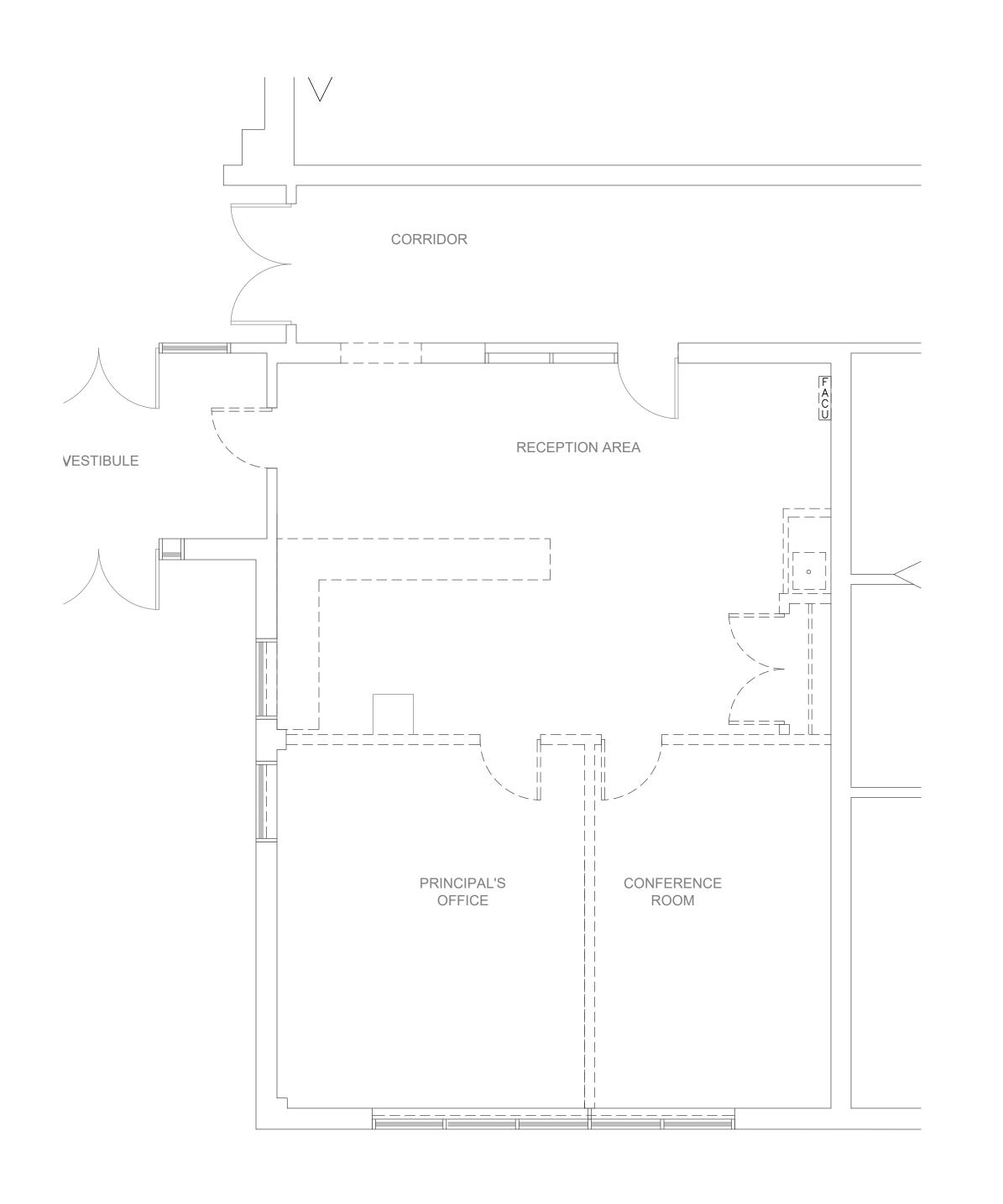
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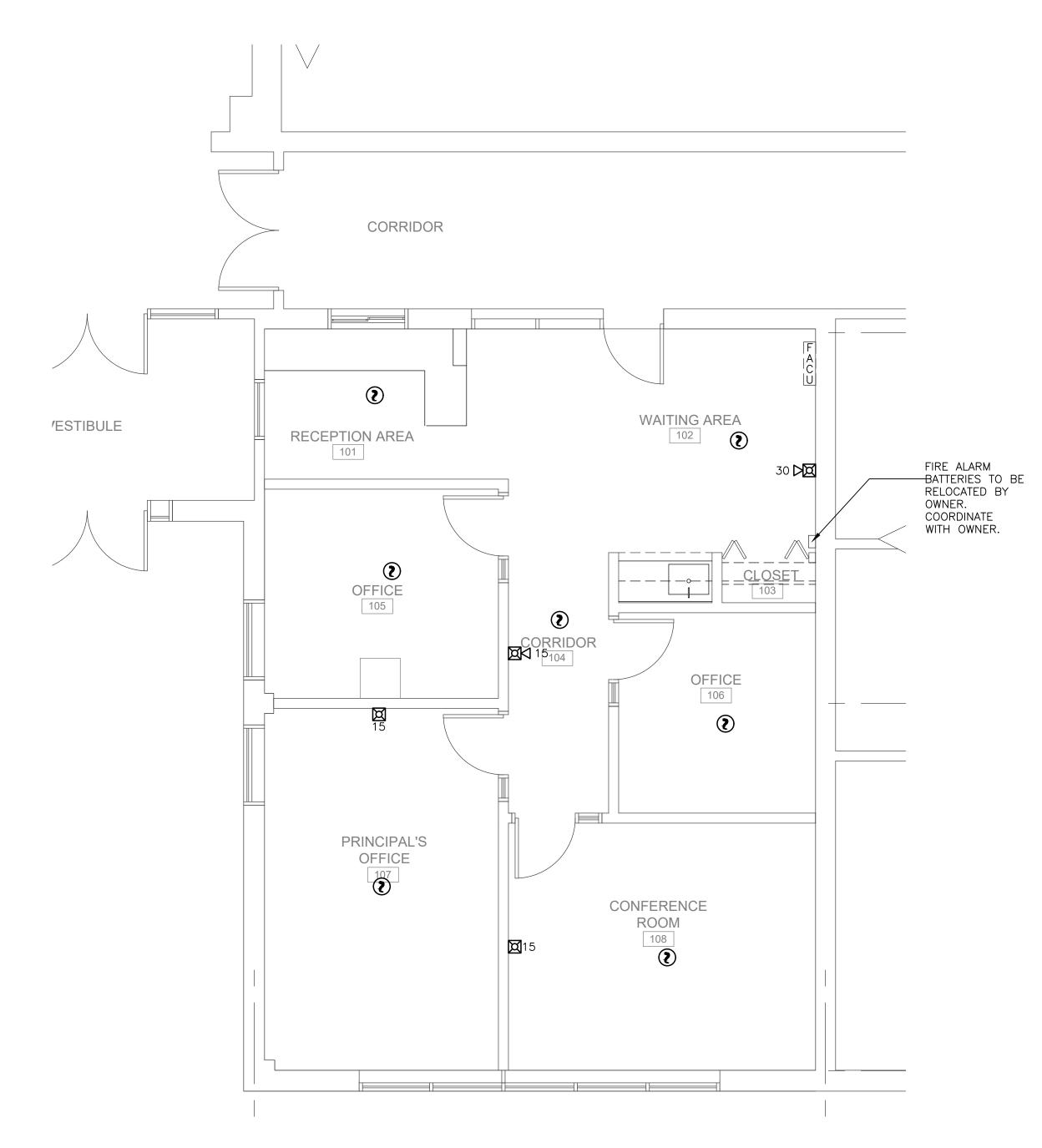
Fire Alarm Legend, Notes and Abbreviations

FA-0.0



1 EXISTING/DEMO FIRE ALARM FLOOR PLAN

SCALE: 1/4" = 1'-0"



2 NEW FIRE ALARM FLOOR PLAN
SCALE: 1/4" = 1'-0"



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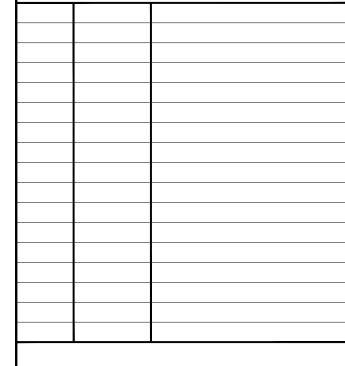


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Fire Alarm Demolition and New Plans

FA-0.1